MARCH 13, 1937

ELECTRICAL WORLD

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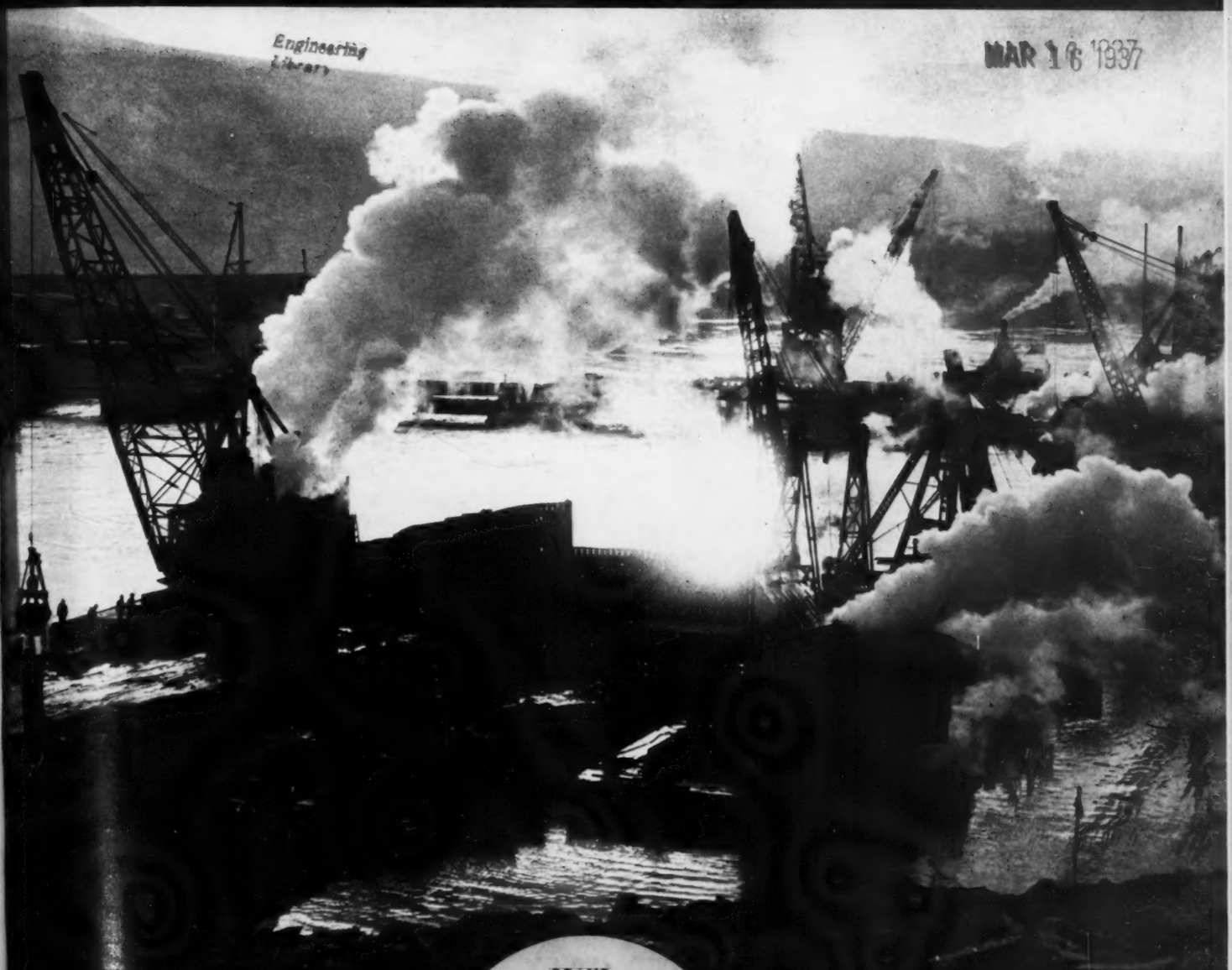

GRAND COULEE UNDER STEAM

President's power policy for Bonneville likely to govern disposition of energy from this federal project on the Columbia River

Automatic Lighting Control Safeguards Children's Eyes

Double-Filament Lamps, Controlled by Photo-electric Cells, Maintain Desired Intensity on Desk Surface Despite Variations in Daylight

By [redacted] CAVERLY
Lynn Gas & [redacted]tric Company, Lynn, Mass.

Reprinted from Electrical World Feb. 13th issue

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Coming Features

Appliance Survey

For the first time, this semi-annual feature will include specific figures on the direct sales cost and promotional expense of domestic load building. As before, the data on appliance sales embrace the reports of companies which serve nearly three-fourths of the total domestic customers in the United States. It is scheduled for the issue of March 27.

High-Voltage Operating Problems

Compactness and safety are features of a 350-kv. testing set installed at the testing laboratories of the Los Angeles Bureau of Power and Light for high-voltage research.

Power-Factor Correction

Correction of power factor at the Chrysler plant makes for more effective use of energy for machine drives, allows full utilization of transformer capacity and reduces power bill.

Product Handling

How switchboard conveyor control is used by one warehouse to minimize delays due to pile-ups, lower costs of warehouse movements and increase flexibility of the system.

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Contents Copyrighted, 1937, by McGraw-Hill Publishing Company, Inc.

ELECTRICAL WORLD—Published every Saturday. Price 25 cents a copy. Subscription rates: United States, Canada, Mexico, Central and South American countries, $4 a year; all other countries, $6 or 24 shillings a year. Entered as second-class matter November 16, 1936, at Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Branch Offices: 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, Aldwych, London, W.C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

McGRAW-HILL PUBLISHING COMPANY, INC.

Publication Office: **99-129 North Broadway, Albany, N. Y.**

Editorial and Executive Offices: **330 W. 42d Street, New York, N. Y.**

JAMES H. McGRAW, JR., Chairman — MALCOLM MUIR, President — JAMES H. McGRAW, Honorary Chairman

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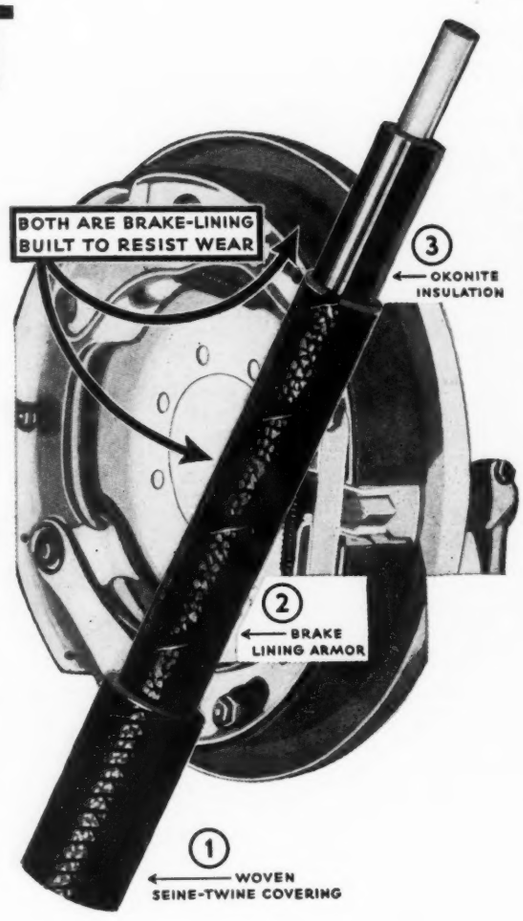

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Letters TO THE EDITOR

Differs on Welder Disturbance

To the Editor of ELECTRICAL WORLD:

In your December 5, 1936, issue, page 45, is an article "Welder Energy Supply a Service Problem," wherein the statement is made "that the average consumption is 3.3 kw.-hr. per month per kva. of transformer capacity required."

Figuring this on the basis of the figures contained in Table I and being very conservative about it, this would mean that for a 15-kw. unit, transformer capacity being 10 kva., there would only be 33 kw.-hr. per month used. This would indicate something in the neighborhood of fifteen or twenty pounds of electrode per month, which on the face of it is ridiculous; or, take it another way, on the basis of 40 hours a week, and four weeks in a month, and depositing four pounds an hour, this would give us rather roughly around 1,200 kw.-hr per month or 120 kw.-hr. per kva. transformer capacity installed.

I think the article is right in that it says "the matter of welder rating is very important from the utility standpoint," but the entire article seems to be based upon the installation of a single-phase load on a regular three-phase power line, and there is no doubt that a single-phase load does cause considerable difficulty. In addition to that, the capacity which has been installed for welding is apparently not being used anywhere near to the degree possible. It should be clearly brought out that resistance welders are being considered in this article and that the standard direct-current welders do not have these undesirable characteristics. The opposition to welding equipment on utility lines implied in this article, as you can see, therefore is not justified.

E. W. P. SMITH,
Consulting Engineer,
Lincoln Electric Company.

To the Editor of ELECTRICAL WORLD:

In reply to Mr. Smith's comments on the article "Welder Energy Supply a Service Problem," may I state that his figures on pound of electrode melted indicate that he is thinking in terms of arc welders in steady use for production purposes. We were considering only single-phase resistance welders and alternating-current arc welders used in repair and jobbing shops and regret that fact was not more clearly brought out.

There are many installations of alternating-current arc welders in repair shops where the melting of fifteen or twenty pounds of electrode per month will make enough repairs to bring the owner a very handsome return on his investment. I have in mind also a sheet metal shop with a 15-kva. spot welder used for the fabrication of exhaust fan housings. Although the welder uses less than 50 kw.-hr. per month, it is indispensable to that particular operation.

Many of these shops are located outside the industrial area and may even be in a residential district where lighting flicker cannot be tolerated. A separate transformer is therefore necessary to isolate the load and, since the consumption of current by this type of installation is so low compared to the transformer capacity required, the transformer investment by the utility is not warranted unless a special minimum charge is made.

Direct-current arc welders are connected to the lines as any other motor load and do not present such a problem.

ARTHUR L. LANE,
Sales Engineer,
Detroit Edison Company.

•

No Break in Committee Study of System Engineering

To the Editor of ELECTRICAL WORLD:

As former chairman of the electrical equipment committee, Edison Electric Institute, I was very much surprised to read your editorial, "System Reliability Comes to the Fore Anew," in the January 16 issue of the ELECTRICAL WORLD.

When the electrical equipment committee was organized by the Edison Electric Institute it was specifically charged with the work formerly covered by the electrical apparatus committee, the power systems engineering committee and the major portion of the work formerly carried by the meter committee of the N.E.L.A. Your statement that the power systems engineering committee has had no equivalent since the N.E.L.A. was disbanded entirely overlooks this fact. This is quite surprising in view of the fact that representatives of the ELECTRICAL WORLD have been invited to attend, and have attended, practically all of the sessions of the electrical equipment committee.

The conditions that you have suggested for study and discussion have been constantly before this committee and in many of our meetings a major portion of the program has been devoted to questions of this kind. Further, whenever there has been a major interruption of any of the large systems, the information surrounding these interruptions has been presented to the committee and thoroughly discussed. These discussions have usually brought out constructive ideas for minimizing future possibilities of this kind.

There is no disagreement between the thoughts expressed in your editorial and the opinions of the committee and its members on these important questions. The only difference seems to be that you have not been aware of the committee's activities.

A correction to the impressions which you have given in your editorial would seem to be in order in a future issue.

W. F. SIMS,
Chief Electrical Engineer.
Commonwealth Edison Company,
Chicago, Ill.

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Reactions on Washington School Lighting

To the Editor of ELECTRICAL WORLD:

Referring to an article entitled "Washington Schools Lead in Lighting," by Aksel Knudstrup, lighting engineer of Potomac Electric Power Company of Washington, D. C., page 70 of ELECTRICAL WORLD, January 16, 1937, I wish to protest vigorously against the misleading statements both as regards the foot-candle values given in the captions and text and the headline that "Washington Schools Lead in Lighting."

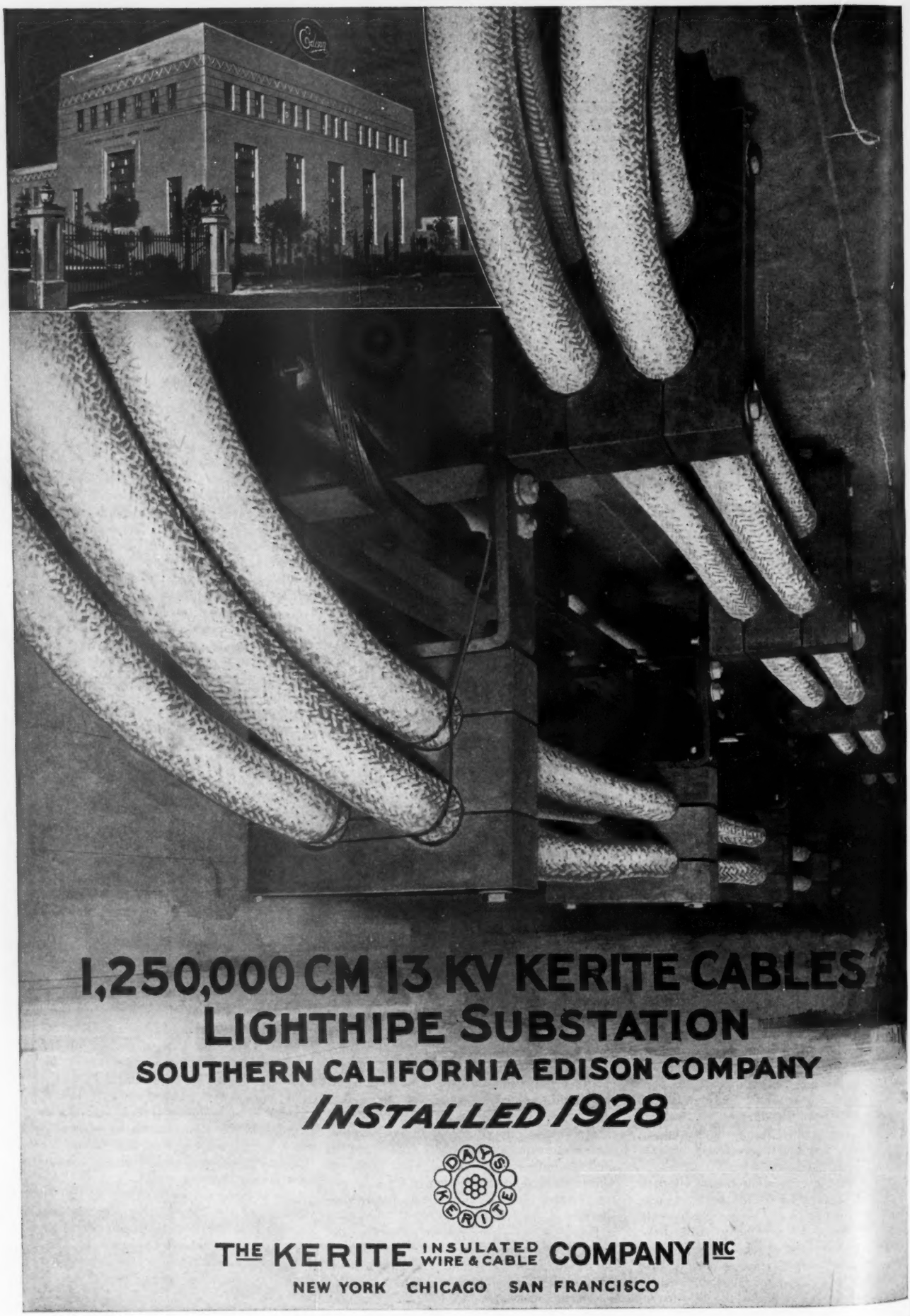
Every foot-candle value given in the article is padded from 105 to 140 per cent so that the reader would gain the impression that the Washington schools actually had the high foot-candle values shown in the article and that they were securing this high illumination for a most conservative wattage consumption.

As a basis for this criticism consider the classroom lighted by six 500-watt totaly indirect units giving 4 watts per square foot where 38 ft.-candles is claimed. Using the data from "Illumination Design Data," October, 1936, it is found that for a 75 per cent ceiling, 50 per cent walls, room index E, the coefficient of utilization is 31 per cent. Four watts per square foot is equivalent to 78.4 lumens per square foot, which, with a 31 per cent utilization, gives 24 ft.-candles and with a 65 per cent maintenance factor shown in Illumination Design Data for indirect units will give 15.7 ft.-candles in the classroom instead of the 38 ft.-candles claimed. In this calculation I have purposely given Knudstrup all the breaks, as I know the average wall reflection, including the windows and blackboards, is less than 50 per cent. Also, I have taken nothing off for the permanent loss in reflection factor of the ceilings due to dirt and dust.

It would seem, therefore, that the Washington schools do not lead in lighting as the actual illumination values in classrooms is now 12 ft.-candles, with 15.7 ft.-candles for future classrooms and with 22.5 ft-candles for future drafting rooms.

As pointed out by Harrison in the *Transactions* of the Illuminating Engineering Society, 1936 convention paper, if 38-52 ft.-candles were actually secured by the use of indirect lighting, it would represent poor practice, for the ceiling would be offen-

[*Continued on page* 116]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ELECTRICAL WORLD

MARCH 13, 1937

Discouragement Is Now on the Other Foot

The electrical industry should take heart in the implications of the President's address on March 4 at the Victory Dinner of the Democratic party. It sounds very much like an admission that his program for cheap power via the T.V.A. route was contrary to law as presently written and interpreted by the courts.

"Modern science," said the President, "knows how to protect our land and our people from the recurrence of such [flood] catastrophes and knows how to produce as a by-product the blessing of cheaper electric power. With the Tennessee Valley Authority, we made a beginning of that kind of protection on an intelligent regional basis.

"But how can we confidently complete that Tennessee Valley project or extend the idea to the Ohio and other valleys while the lowest courts have not hesitated to paralyze its operations by sweeping injunctions?

"But I defy any one to read the opinions in the T.V.A. case, the Duke power case and the A.A.A. case and tell us exactly what we can do as a national government in this session of the Congress to control flood and drought and generate cheap power with any reasonable certainty that what we do will not be nullified as unconstitutional."

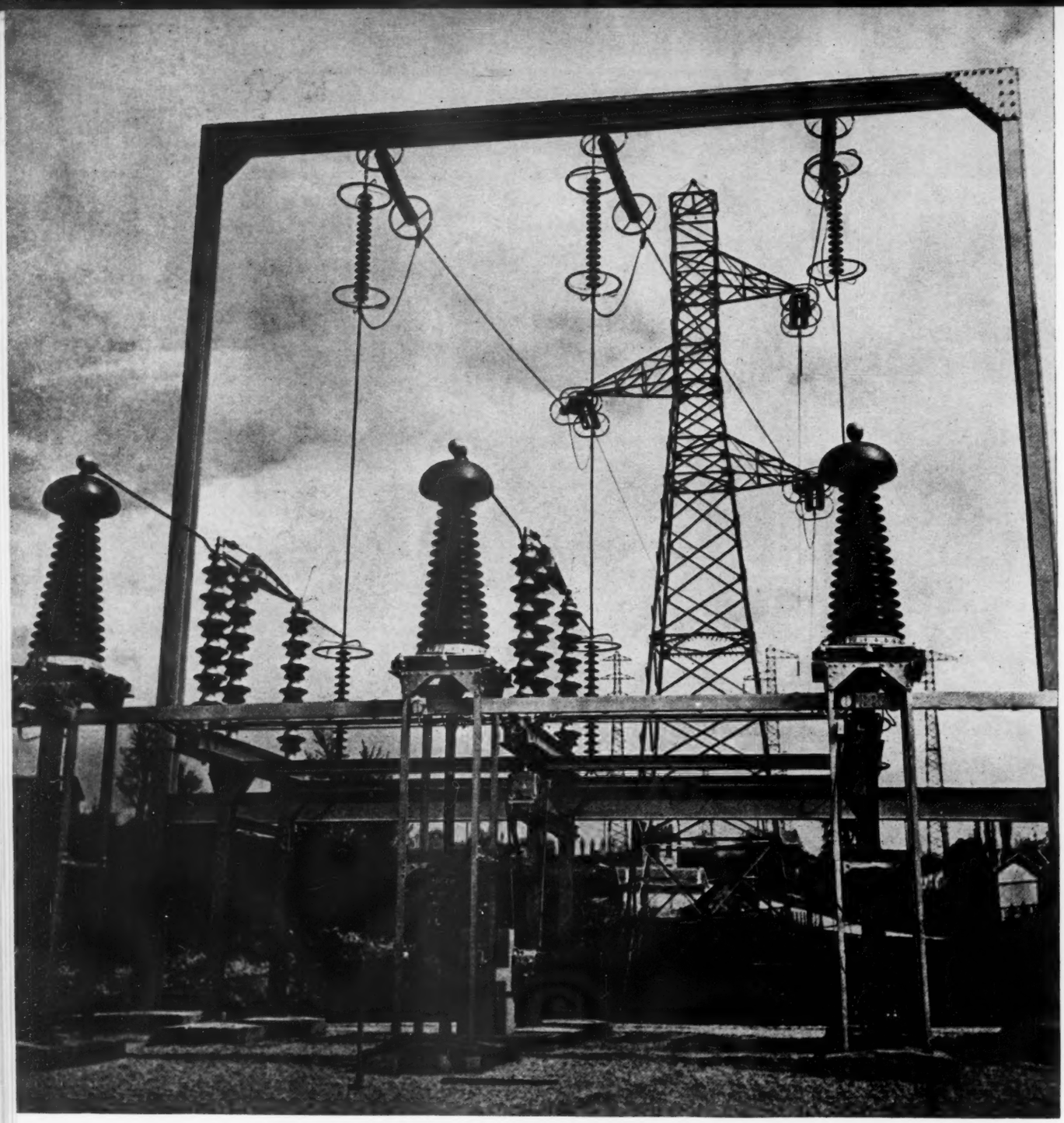
Why the flood camouflage reference? Judge Gore, and the President admitted that the reference was to him, has merely restrained the T.V.A. from further extending its lines and selling energy in areas now served by private utilities. It had nothing to do with flood control, nor did it have any effect upon the progress of dam construction upon the Tennessee. In fact, T.V.A. is now pressing its dam construction day and night. The T.V.A. decision, up until the President's address on March 4, had been hailed, and not the least vigorously by T.V.A. itself in its last annual report, as a victory for the Administration, although it merely upheld the right of the government to dispose of power generated at Wilson Dam as a by-product of navigation control. The Duke Power decision returned the case to the lower courts with instructions that orderly procedure of presenting evidence and conducting a case be followed.

No court has questioned the government's right to engage in flood control of navigable streams. It is only where government attempts to add to a flood control measure some other program, such as subsidized electric power, that the project becomes involved in the courts.

The record of congressional hearings shows that flood control for the Tennessee could be had for but a fraction of the present T.V.A. cost. The big cost in that project is the construction of power dams. One, therefore, cannot help wondering if the President was sincere in his reference to floods and if perhaps what was really annoying him was his inability to engage in subsidized competition with private industry in a cheap power program of the T.V.A. concept.

The President has every reason to be disturbed over the outlook for T.V.A. and Bonneville and similar contemplated agencies. Economically unsound ventures sooner or later always return to torment their sponsors. Unless the President can be successful in "packing" the Supreme Court with justices who are willing to declare that private capital can be destroyed by unfair competition on the part of the government there is no practical way, short of taking over existing properties at fair values, that any considerable amount of T.V.A. or Bonneville power can be marketed in the interest of national economy except through private utilities.

The Administration's Supreme Court appeal is a last stand. It has all the appearances of an admission of defeat. It should lend courage to the electrical industry in its efforts to preserve the property rights of its investors.



TERMINALS OF FIRST 220-KV. CABLE

Ring bus which Paris has initiated has 19 km. of 220-kv. single-conductor cable, the world's first. Details are presented on page 50.

Power Factor, Power Bills and Low Voltage

Correction of Low Power Factor Is Reflected in Improved Voltage Conditions on the Plant Distribution System as Well as in the Power Bill

WHEN it became apparent a year or so ago that the continuing addition of new equipment in the machine shop of the Chevrolet plant at Muncie, Ind., had finally resulted in a condition of poor voltage on the electrical distribution system the obvious remedial step was to install power-factor correction capacity. This reactive capacity would also be effective in raising the entire plant power factor and would thus serve to reduce the cost of power, which is billed on a modified kva. demand basis.

The condensers, in 440-volt, 15-r.-kva. units were installed overhead in the machine shop in seven blocks, six of 120 r.-kva. and one of 105, as is shown on the accompanying diagram. Previously, and effective for the load at the time it was made, a low-voltage condition in the machine shop had been much improved by the installation of a tie bus, to which, through oil circuit breakers, connections were made from the busbars of the seven distribution panels. This tie, of 500,000 circ.mil cable, served to equalize the voltages at the ends of the seven feeders, also 500,000 circ.mil, from the substation and thus raised the pressure in the shop areas where low voltage had been troublesome.

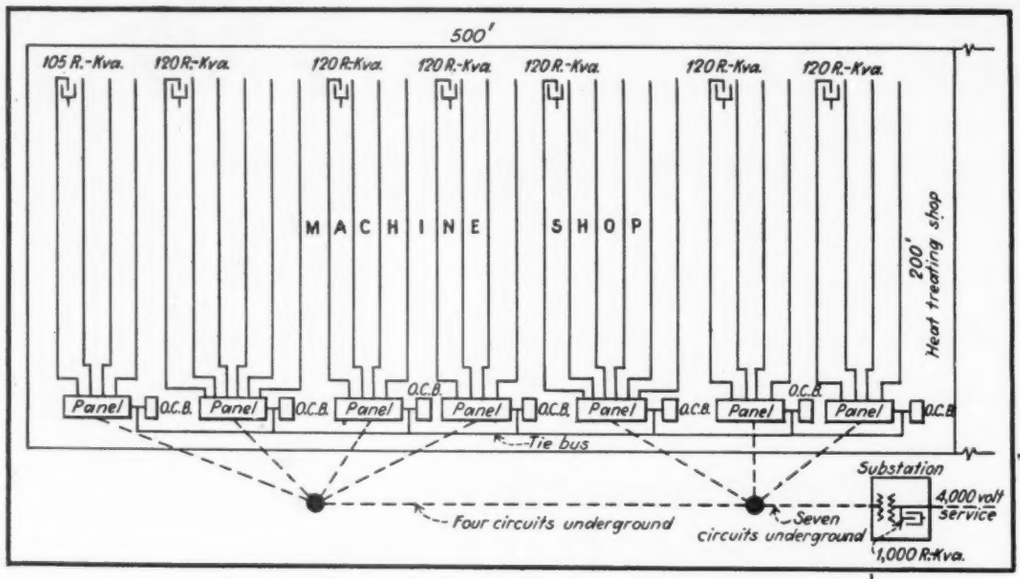
Capacitors installed overhead

This bank of 440-volt capacitors, indicated by the white arrow, totalling 120 r.-kva., is connected, like six others in the same machine shop, at the end of a run of "Flex-A-Power."

The runs across the shop from the distribution panels are of "Flex-A-Power," a metal-inclosed bus of copper bars from which machine connections may be taken at any point by the installation of fused tapping devices. Because of the size of the copper in this system it was apparent, and was proved by voltage readings, that the troublesome pressure drop was in the feeder cables. It was for this reason that the tie bus was installed along the side of the machine shop where the distribution panels were located. Also, and in itself an important reason, the tie bus required here only seven connections, indicated by the oil circuit breaker symbols on the diagram, where 32 connections would have been necessary for full utilization of the tie bus capacity had it been placed on the far side of the shop.

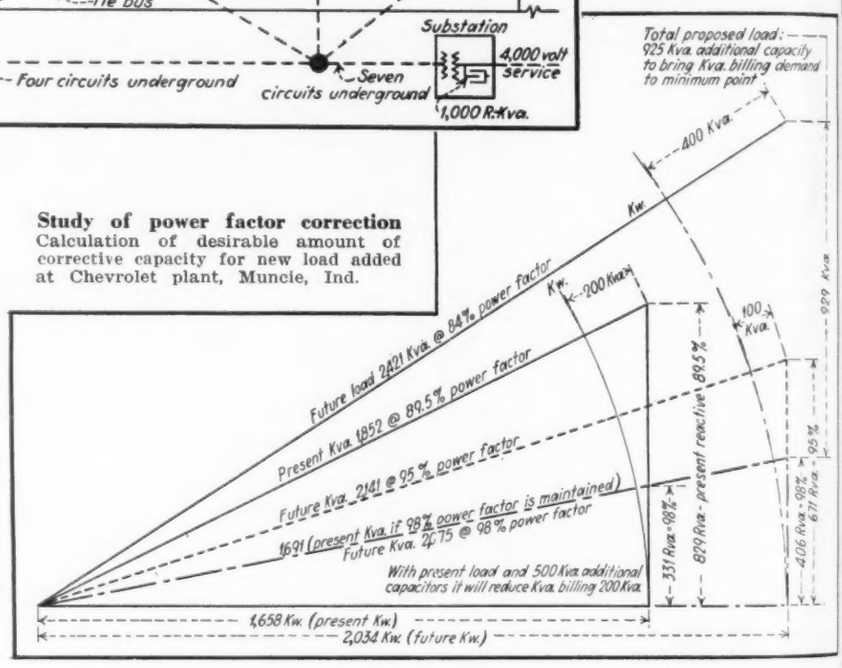
This explanation discloses the reason why, when more machines were later installed in the shop and the voltage level was again depressed, the condensers for correcting the recurred condition were set over near the opposite wall. With the tie bus and its associated circuit breakers already occupying headroom on the near side there was no convenient space on this side where the capacitors could be put. There was no reason, as regards the electrical distribution, why they should not be at the far side, and there they were installed. Of course, the "Flex-A-Power" runs that have the condensers at their ends are probably carrying leading power factor loads, but that makes no difference to the ample copper in the bars inside the inclosures.

The net effect of the tie bus and the condensers in the machine shop was to cure the low-voltage condition there and as well, in conjunction with 500-



To correct low voltage

Combined effect of tie bus connecting ends of feeds at distribution panels and 825 r.-kva. of condenser capacity cures low voltage in machine shop.


Total proposed load: 925 Kva. additional capacity to bring Kva. billing demand to minimum point
400 Kva.
Kw.
200 Kva.
100 Kva.
Future load 2421 Kva. @ 84% power factor
Present Kva. 1852 @ 89.5% power factor
Future Kva. 2141 @ 95% power factor
1691 (present Kva. if 98% power factor is maintained)
Future Kva. 2075 @ 98% power factor
With present load and 500 Kva. additional capacitors it will reduce Kva. billing 200 Kva.
1,658 Kw. (present Kw.)
2,034 Kw. (future Kw.)
89.5%
95%
98%
929 Kva.
829 Kva. - present reactive
331 Kva. - 98%
406 Kva. - 98%
417 Kva.

Study of power factor correction

Calculation of desirable amount of corrective capacity for new load added at Chevrolet plant, Muncie, Ind.

r.-kva. of condenser capacity installed at the 4,000-volt service entrance, to raise the entire plant power factor to around 90 per cent, an improvement readily noticeable in the power bill. Last summer, when arrangements were made for production of 1937 model cars, there was again a considerable addition of new equipment. This new equipment represented new connected load of 858 hp. At a motor efficiency taken as 85 per cent and a use factor estimated at 50 per cent, this meant the addition of 376 kw. to the existing demand of 1,658 kw. in the plant. The additional load would operate at a power factor of approximately 60 per cent.

While the copper and corrective capacity already installed in the machine shop would be enough to prevent the low power factor of that part of the new load added there from causing troublesome low voltage, there would be a lowering of the entire plant power factor and the result would be quite apparent in its effect on the power bill.

To correct this easily foreseen condition it would be sufficient to add to the corrective capacity installed on the 4,000-volt incoming line in the substation. Therefore another bank of condensers totaling 500 r.-kva. was installed at this point, with the result that the plant power factor was slightly raised above its previous level of around 90 per cent and the kva. factor in the billing calculation kept reasonably close to its minimum significance.

The Employee in His Community

Walter Gifford has said that "corporations owe their success, and even their existence to the good will of the public." Who so qualified to consummate this fortunate relation as the men and women in daily personal and social contact with that public? They know local conditions intimately, they vote and pay taxes along with their fellow members of churches and societies, their children attend local schools, they and their neighbors preside over the community destinies, they participate in all civic activities. Selected by worth, rather than whim, holding their jobs through fitness rather than favor, permitted to serve without becoming servile, they constitute a bulwark of security for their employers' interest which cannot be too greatly estimated or too worthily appreciated.

—H. B. MAYNARD, Iowa Public Service Company, Waterloo, Iowa

Co-ordination of Fuse Links

Method of Comparing Fuse Links and Relays for Sectionalization and Protection

By E. M. ADKINS
Jersey Central Power & Light Company, Asbury Park, N. J.

THE application of sectionalizing fuses will, in many cases, improve continuity of service on distribution feeders by confining the service interruptions, due to fault current, to a small portion of the total circuit. Automatic sectionalizing under fault condition, by means of fuse links, has been hindered by the difficulty of co-ordinating the time-current characteristics of fuse links with the time-current characteristics of induction type overload relays generally used on distribution feeders. A simple method of securing a direct comparison between the time-current characteristic of fuse links and overload relays through any range of loading has been devised.

Typical time-current characteristics for fuse links normally used in expulsion type cutouts are shown in Fig. 1. The dotted lines cutting across the fuse link curves connect together the points for different per cents of load. Inspection shows that these fuse links have approximately the same characteristic from 10 amp. to 50 amp. If the operating time for sizes 10 to 50 amp. is averaged for the per cent loads shown by the dotted lines a single resultant curve can be plotted with per cent load as one axis and time in seconds as the other axis to represent these sizes. In a similar manner one curve would represent 60-75-amp. links, while 100-amp. links would be shown separately. In Fig. 2 is shown the resultant time-current characteristic curves for fuse links 10 to 50 amp., 60 to 75 amp. and 100 amp. plotted against per cent load and time in seconds as taken from Fig. 1 in the manner outlined.

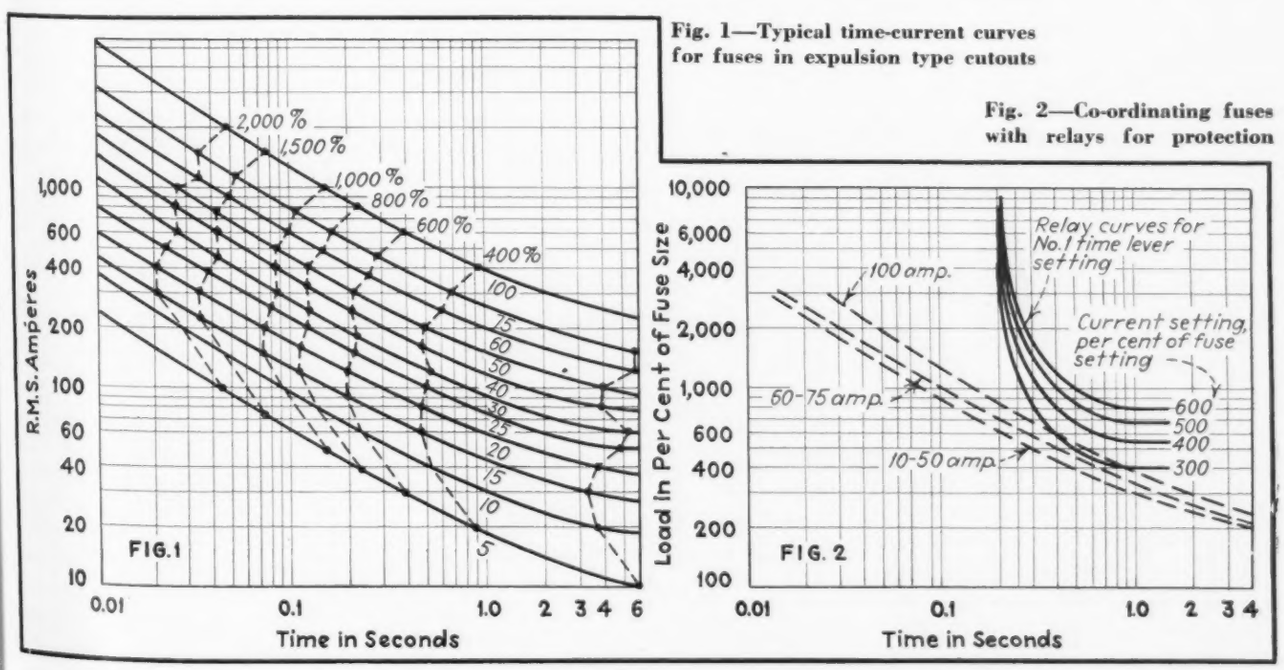
If fuse links are to be used for sectionalizing purposes or for the protection of large transformer banks they must be co-ordinated with the time-current characteristics of the overload relays generally installed at the feeder O.C.B. A direct comparison between the operating time of the fuse and overload relay may be secured by expressing the primary pick-up current or operating current of the relay as a percentage of the fuse size and plotting the time-current characteristic of the fuse and relay against per cent load and time in seconds. This is illustrated in Fig. 2, in which the fuse link curves are for those shown in Fig. 1, and the relay curves are for an induction type, inverse and definite minimum time overload relay. The relay curves are plotted for a No. 1 time lever setting, since this would be the most troublesome from a co-ordination standpoint, and for an operating current, referred to the high-voltage side, of 300 per cent, 400 per cent, 500 per cent and 600 per cent of the fuse size in amperes. For instance, if the relay pick-up setting is 400 per cent of the fuse size and there is 800 per cent load on the fuse there would be 200 per cent load on the relay.

Inspection of Fig. 2 shows the fuse

[*Continued on page 124*]

Fig. 1—Typical time-current curves for fuses in expulsion type cutouts

Fig. 2—Co-ordinating fuses with relays for protection



Paris Ring Bus Employs

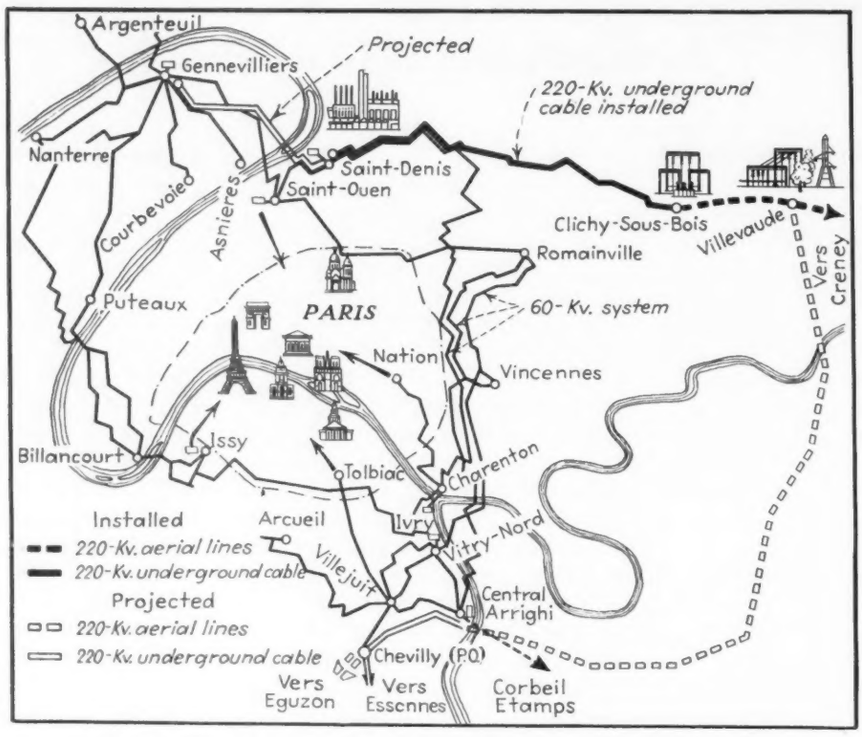


Fig. 1—Paris starts a 220-kv. ring bus with 19-km. cable link

LOADS in the Paris area had grown to the point where the system already had 1,400 km. of 60-kv. single-conductor cable in service. Assurance of growing demand and availability of increased amounts of hydro energy pointed to the need for a ring bus about the metropolitan area. To have confined this bus to an entirely overhead construction of the economically indicated 220-kv. system would have necessitated a 200-km. length of ring because of right-of-way obstacles. If underground cable of this voltage and capable of carrying 160,000 to 200,000 kw. could be perfected the distance could be materially shortened by using city streets where feasible for laying an underground line.

Trial with an experimental section of 220-kv. Pirelli cable 600 meters long installed in 1932 at the Cislago (Italy) station in series with an overhead line had given results encouraging the Inter-Paris organization to institute further development preparatory to the adoption of cable of that voltage rating. Inter-Paris is the short term for Société Parisienne d'Interconnexions Electriques, formed to administer the ring jointly for the Union d'Electricité, Société d'Electricité de Paris, Société Electricité de la Seine and Compagnie Parisienne de Distribution d'Electricité. The desired objective was attained with the assistance of the eventual suppliers manufacturing under the license and supervision of the Società Italiana Pirelli; *viz.*, Forges and Ateliers de Constructions Electriques de Jeumont, Les Cables de Lyon, Société Alsacienne de Constructions Macaniques (Cablerié de Clichy) and Tréfileries et Laminoirs du Havre (Cablerié de Saint-Maurice). The first half of the projected ring has 19 km. of cable route from these sources. It has been operating since March 23, 1936, and according to J. d'Harcourt, director of "Inter-Paris," has since given no important trouble.

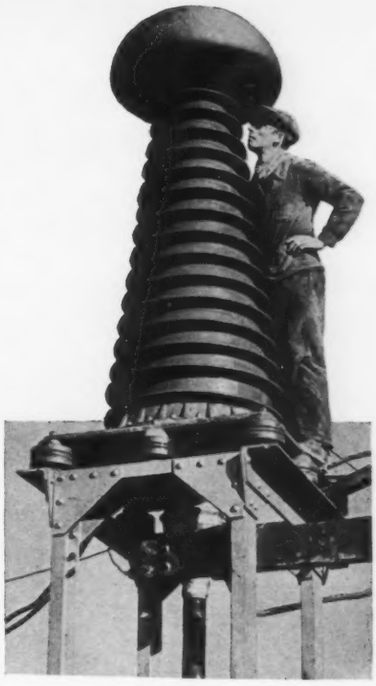
Going higher in voltage than we have had occasion to do in America, Paris has blazed the trail for successful use of a whole hundred kilovolts more pressure on cables. We are more than glad to accept the suggestions and aid of Philip Torchio (Consolidated Edison Company, New York) in making the major technical details available to our world of readers. We are likewise indebted to J. d'Harcourt, director of "Inter-Paris," for data and illustrations.

Preliminary trials at Chevilly

For trial each of the four makers produced 200 meters of single conductor cable and these lengths were installed in two closed rings at Chevilly station. They were directly connected to the 220-kv. incoming line and currents up to 600 amp. circulated in them by means of inverted current transformers fed by station auxiliaries. A year's testing disclosed that the double lead sheath increased the

First 220-Kv. Cable

Epoch-Making Decision Involved Innovations in Fabricating, Testing, Terminating, Installing and Protecting Highest Voltage Underground Cable



effective resistance of the cable about 50 per cent and that 200,000 kva. could be carried when soil temperature was down to 10 deg. C. Also, variations on internal pressure on loading or on sudden variations in load were borne as anticipated, a cable already hot bearing overloads in some cases more easily than a cable starting from soil temperature.

Oil tightness imperative

As a result of these tests the specifications for the cable were established as indicated in the accompanying table. Of paramount importance in connection with the joints, cable terminals and oil reservoirs was the matter of oil tightness. To promote this, all the casings and caps are of tinned copper, in preference to either lead or bronze. Lead could yield under the action of internal pressure and bronze presented the risk of porosity.

In the normal joints (Fig. 3) a three-part connector allows free circulation of the oil. A steel tube is inserted within the interior of the central spiral of each conductor end and these are butted together. The object is to prevent crushing the stranded conductors when a copper sleeve is next pressed into place around the joined conductors by means of a small hydraulic press. During this part of the process oil is allowed to leak out so as to avert entrance of air. After the sleeve has been set an application of varnished cambric tape stops further flow of oil. Stepped insulation is built up by means of paper bands ranging progressively from 5 to 75 cm. in width. The tapered surfaces are then overlaid with lead wire, 2 mm. in diameter, and closely wound, thus in effect prolonging the lead sheath.

The joint is inclosed in a thin copper protecting casing which is sealed to the inner lead sheath on both sides of the joint by lead wipes. This prevents oil leakage into the jute between inner and outer lead sheaths in case of imperfect assembly of the joint. Vacuum is then applied for several hours to the joint, which is heated by externally applied resistors. The joint is then filled with hot oil.

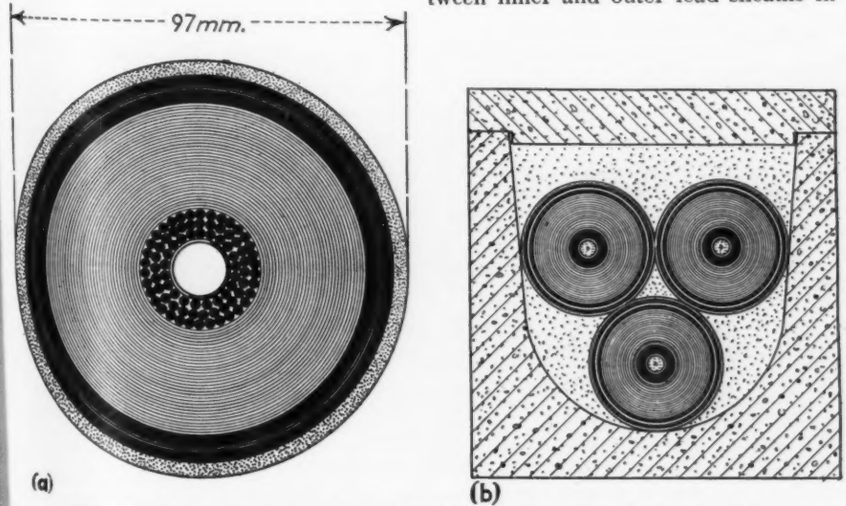


Fig. 2—Three single-conductor double-sheath cables in single duct

(a) To avoid any injurious potential between the two lead sheaths they are bonded throughout by brass binding strips and also soldered together at the joints.
(b) Laid in concrete trough; factory-built sections of one-meter length; weight with cover and dowels, 80 kg. each.

Two terminals constitute stop joint

Stop joints (of which there are 33 to sectionalize each conductor into twelve sections) consist of two terminals joined end to end and inclosed in a casing filled with oil. The central element comprises two porcelain conical shells and is factory assembled as follows:

(a) The large end of each porcelain is fitted with a bronze base and flared shell or shield; (b) at the small end there is sealed an oil-tight bronze cap to form a seating for the cable conductor; (c) the two porcelains are placed end to end and the bronze caps joined by a flexible connection to allow for expansion; (d) a two-part copper shield is placed around the bronze caps; (e) two aluminum annular shields insulated with paper are then placed, one at each end of the copper shield. All this apparent complexity is incorporated to effect a proper distribution of the electrostatic field.

Insulation is then built up over the various parts (including the porcelains) much in the manner of normal joints as just described. The whole structure is inclosed in a tinned copper casing screwed to the bronze shields. Vacuum and heat are applied and then impregnation is applied in the same way as for the cable itself. The joint is then ready for delivery to the job.

At the site preparations for completing the joint proceed as follows:

The end of the conductor is equipped with a special end piece fitted with a valve which is kept closed by internal pressure of the oil in the cable. This cap is prolonged in the form of jointed segments

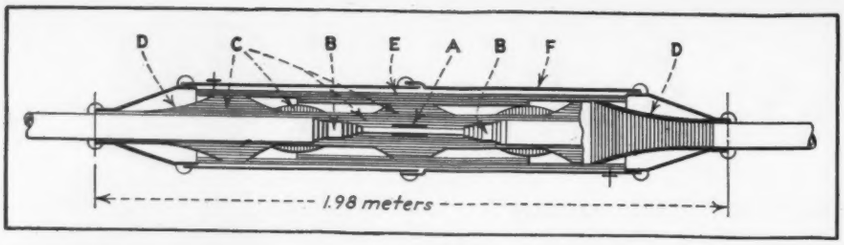
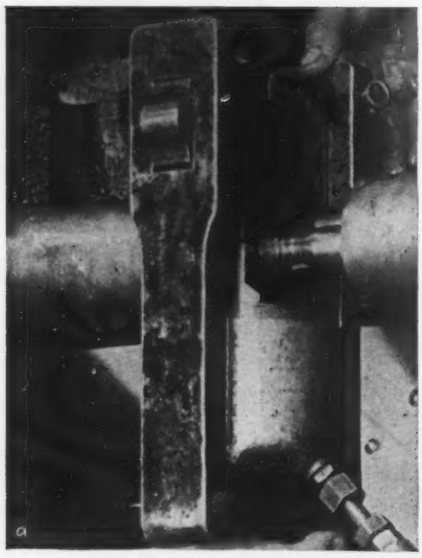
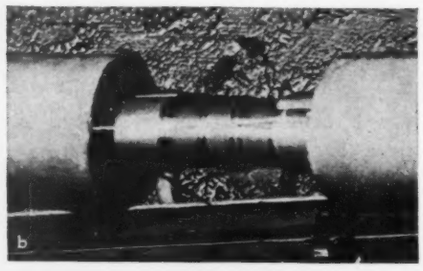


Fig. 3—Normal joint two meters long

A, connector; B, stepped insulation; C, built-up insulation; D, lead wire; E, copper shield; F, casing





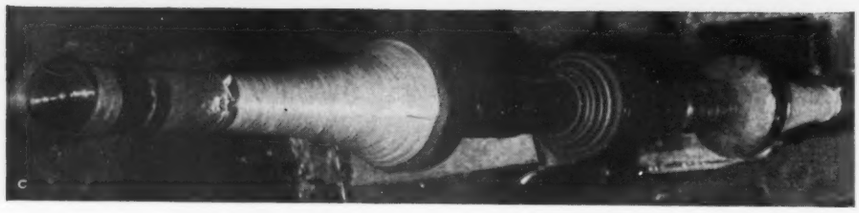


Fig. 4—Method of building up normal joints

(a) Pressing on the connector.
(b) Connector in place.
(c) Wrapping of lead wire and building up of insulation.

kept apart by small springs. Stepped insulation is applied up to the end piece and also over the cable itself. Over all this there is applied a closely wound lead wire wrapping.

Assembly of the joint then consists merely of inserting the two prepared cable ends so that their end pieces penetrate to the bronze caps sealed to the porcelains. The finished joint thus embraces three separate compartments and each can be treated independently as to vacuum, heating and impregnation. When these treatments are concluded the compartments are filled with oil and connected to the respective oil reservoirs. The small valves mentioned then open under the pressure of the reservoir oil. As a final step the central compartment is connected to whichever reservoir has the higher pressure so as to minimize the differential pressure on the porcelain cones.

Terminals have grading caps

In applying the 6-ft. porcelain bushings (Fig. 6) the two lead sheaths of the cable are removed for a length of 2.4 meters and the insulation built up at four points, the first, at the bottom, being 87 cm. long. Each of the others is 30 cm. long. Lead wire is wrapped around the lower portion of the long section.

The end of the bare conductor has a copper ferrule and steel rod serving as a valve separating the cable terminal from the central oil duct during assembly. After the cable has been stepped, the ferrule of the valve welded to the upper cap of the bushing and the lower cap welded to the base of the bushing and to the lead sheath of the cable the vacuum application and impregnation take place. Then the oil duct of the cable is put into communication with the interior of the terminal by withdrawing the steel rod which has served as a valve.

Three cables laid in one trough

All three single-conductor cables are laid in a single trough of concrete in contact with one another. The trough is factory-built in 1-meter lengths, with dowels for alinement. Each section with cover weighs about 80 kg. This type of construction has given satisfactory service since 1920 on the 60-kv. system of the Paris area.

The profile of the route ranges from the high level (at Clichy-sous-Bois), of 80 meters to 30 meters, with the Saint-Denis level at 41 meters. The maximum difference in level between two consecutive stop joints is 10 meters. There are twelve sections and the cables for each were manufactured to exact length, not only over all but for each length between normal joints. There are 231 normal joints and the intervening lengths range from 160 to 250 meters, with an average of 210 meters.

At stop joints the separation between phases (Fig. 7) was effected by brickwork partitions put in after assembling the joints. Oil reservoirs are placed in independent concrete compartments under the joint com-

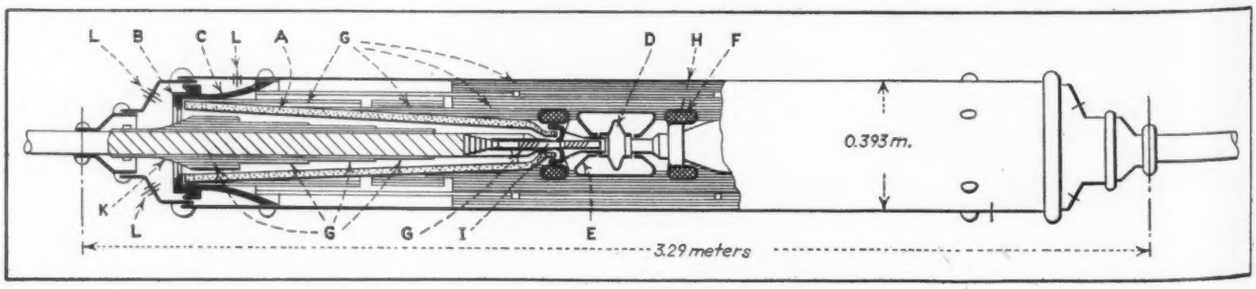


Fig. 5—Stop joint in longitudinal section

A, porcelain; B, base; C, bronze shield; D, flexible connection; E, copper shield; F, annular aluminum shield; G, built-up insulation; H, casing; I, bronze cap; K, lead wire; L, pipes connecting to oil reservoir

partment. These are accessible through a locked inspection hole. The entire cable employs 270 low-pressure reservoirs and 30 high-pressure reservoirs. The cable proper contains approximately 95,000 liters of oil.

Minimum laying depth is 1.3 meters to the bottom of the trench and the maximum depth to avoid obstacles was about 4 meters.

Fabricating the cable

New large tanks for drying and impregnation had to be provided by the manufacturers. The taping machines and lead presses called for new developments. The test laboratories had to be especially equipped to conduct the requisite high-voltage tests on the cable samples and on finished lengths. One of the cable machines was devised to wind the 200 layers of paper insulation in one pass. The drawing problem was met by designing the caterpillar tractive mechanism seen in the foreground of Fig. 8.

Inasmuch as the paper may be subjected to gradients as high as 9.1 kv. per mm. it was imperative to treat the wood pulp paper very thoroughly. After comparative tests the paper adopted was one meeting the following requirements:

Longitudinal breaking strength (kg. per sq. cm.)	500
Corresponding extension (per cent)	2.5
Transverse breaking strength (kg. per sq. cm.)	245
Corresponding extension (per cent)	4.5

Oil used was distilled from a raw petroleum of Russian origin. It had an average specific weight of 0.895 grams per cu.cm. Viscosity ranged from 225 centipoises at —10 deg. C. to 9 centipoises at 50 deg. C. Tolerances of ± 20 per cent were allowed in these tests with the Engler viscosimeter. Other characteristics of the oil were as follows:

Flash point (open crucible), deg. C	155
Alkalinity	nil
Mineral acidity	nil
Organic acidity (max. by KOH), mg.	0.04
Acidity after max. heating, mg.	0.4
Maximum sludging, per cent	0.065
Fluidity to, deg. C.	—20

Each maker produced from 60 to 75 drums of cable and in order to expedite the production certain fabricators put in as many as seven impregnation tanks.

Factory tests were made at ambient temperature, with 50-cycle sinusoidal voltage. Each length was subjected to 250 kv. for 30 minutes, between conductor and lead. Then the power factor of the dielectric, measured at 127 kv. and 80 deg. C. was tested to assure that it did not exceed the specified value of 0.007. Sample lengths were subjected to 350 kv. for 24 hours. After cooling the 350 kv. was again applied and raised at the rate of 50 kv. per minute to determine puncture value, which was to be not less than 450 kv. Several samples were actually kept at 450 kv. for 24 hours without failure.

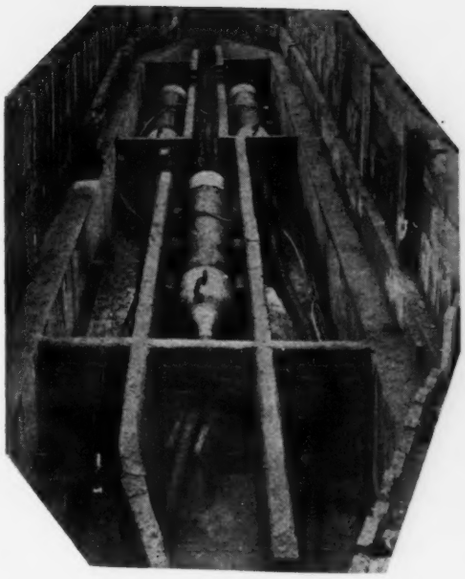


Fig. 7—Upper chamber of stop-joint cell

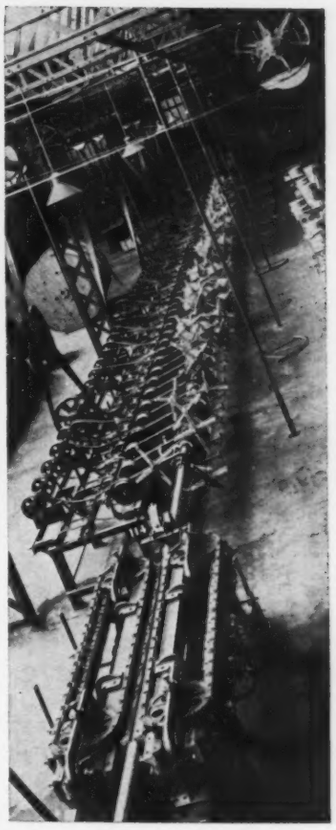


Fig. 8—Cable insulated in one pass

Caterpillar drive (foreground) drew cable through machine

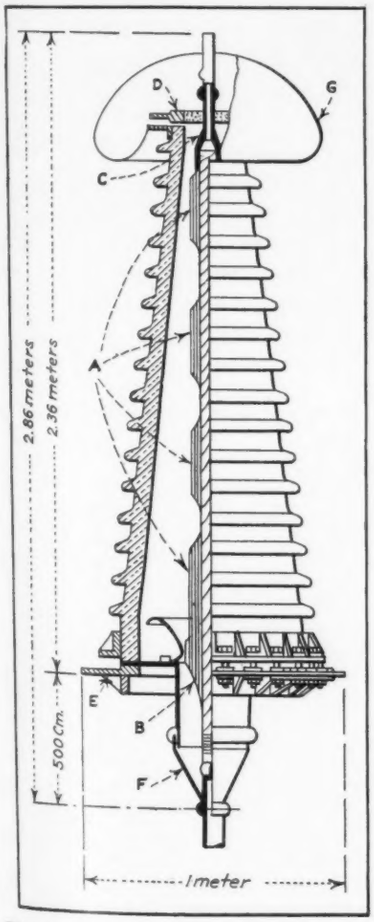


Fig. 6—Terminal bushings nearly three meters long

A, built-up insulation; B, lead wire; C, ferrule; D, cap; E, bronze cap; F, lower cap; G, potential grading cap

Specifications of Paris 220-Kv. Cable

Diameter of oil duct, mm.	15
Thickness of spiral, mm.	0.6
Section of conductor, mm.².	350
Number of 2.3-mm. strands	83
Total thickness of impregnated paper insulation, mm.	24
Thickness of paper used, mm. 0.08, 0.10, 0.12	0.15
Diameter of cable without lead sheathing, mm.	76
Thickness of first lead sheath, mm.	3.2
Thickness of brass binding strips mm.	0.8
Thickness of protective jute covering (about), mm.	3.8
Thickness of second lead sheath, mm.	2.5
Diameter over second lead sheath, mm.	89.5
Over-all diameter of cable, mm.	97
Weight per meter, kg.	27.3
Rating and losses:	
Normal voltage, kv.	220
Normal current (corresponding to 160,000 kva.)	420 a.
Losses at normal voltage & current:	
a) in the copper, kw./km.	10
b) in the dielectric, kw./km.	3.4
c) in the lead, kw./km.	5
Charging current under normal voltage, amp./km.	8

Identifying Code Simplifies Meter Bookkeeping

Reduction of Nameplate Data and Other Identifying Information to Code Expression Shortens Meter Descriptions and Reduces Record and Order Labor

By E. G. McKINNEY
Meter Department, Oklahoma Gas & Electric Company

SPEED, accuracy and labor saving are accomplished in all records and references to meters in the Oklahoma Gas & Electric Company by a meter-identifying code which has been in use and been developed by the company over a period of about twenty years. Any conversation relating to meters is much faster and more accurate when the code is used. The meter tester has complete instructions when told to test an 11-CS-. The service man is on his way quickly when told to set a 203-E. There is much less chance of error in this type of shorthand than in the use of the lengthy description that otherwise must be necessary.

Record keeping is simplified and the chance for error is reduced when the code is used. The daily log for checking meters in and out of the meter storeroom is only one, but on this record alone much time is saved by using the code instead of writing out a complete description of the meter in terms of the meter nameplate data.

Two perpetual card inventories are maintained in the meter department to show the meters that are in the storeroom. The code gives a complete description of each meter and saves much time here.

It is the same in other ways as in taking a physical inventory, keeping records in the stores and accounting departments; in all cases there is convenience and economy in using the code.

It may seem that the code is very complicated in some cases. For example: DY2-2003-LW- appears to be very complex, but comparison with the usual description will make it seem more usable.

DY2-2003-LW- equals—General Electric Type DW-14 with D-13 contacts, for use with instrument transformers. The meter potential coils are rated at 220 volts. The meter is being used for four-wire delta metering on a 1,000-amp., 220-volt circuit.

A direct comparison such as this shows how much has been compressed into a few letters and numbers.

The code identification is placed on the meter dial face or on the nameplate itself if space is provided by the manufacturer. The letters and numbers of the code are large enough to be read some distance from the meter. This make it possible to know all the meter nameplate data, except factory serial number, without having to get close enough to see the small figures and letters that are stamped on the nameplate.

Code has four elements

What is this code? Its details are set forth elsewhere in this article in a display panel. It has four parts:

1. Company number.
2. Type identification.
3. Current and voltage indication.
4. Identification of transformer type of delta and multi-circuit meters and of meters equipped with a demand type register or demand contacts.

The company number is a serial number assigned to the meter at the time it is received from the manufacturer. The numbers start at 1 and continue as more meters are added to the system.

The meter type identification is a

Electric Meter Code

Amperage		Voltage			Make and Type			Make and Type		
Amps.	Code	Volts	Wire	Code	Make	Type	Code	Make	Type	Code
5	1	110	1, 2, 3, 4	1	GE	I	I	W'h'se	A	A
10	2	220	2	2	GE	I–10	H	W'h'se	B	B
15	3	220	3, 4	3	GE	I–14	X	W'h'se	C	C
20	4	440	2	4	GE	I–16	J	W'h'se	OA	OA
25	5	440	3	5	GE	I–18	U	W'h'se	OB	OB
30	6	600	2	6	GE	I–20	P	W'h'se	RA	RA
40	8	2,200	3	7	GE	D–3	D	W'h'se	RO	RO
50	10	2,200	2	8	GE	D–6, 7	E	W'h'se	OC	OC
60	12	4,000	2	9	GE	D–9	F	W'h'se	CS	CS
80	16	4,000	3	10	GE	D–14	L	W'h'se	CS–5	CS–5
100	20	4,000	4	11	GE	D–15	Y	Dun.	M–2	M-2
150	30	6,000	2	12	Sang.	H	H	Dun.	MD	MD
200	40	6,000	3	13	Sang.	HF	HF	Dun.	MF	MF
250	50	13,000	2	14						
300	60	13,000	3	15						
400	80	22,000	2	16						
500	100	22,000	4	17						
600	120	33,000	2	18						
700	140	33,000	3	19						
800	160	63,000	3	20						

Sequence types A, B, C and S are indicated by adding the proper sequence letter to the type code.

Where the same type meter can be had in 1, 2 or 3 elements, the number of elements is shown by adding the proper digit, 1, 2 or 3, to the type code.

Transformer type meters are identified by the letter Y preceding the other parts of the code. A digit immediately following the letter Y indicates the voltage rating of the potential coils. Y1 for 110 volt, Y2 for 220 volt and Y3 for 440 volt potentials.

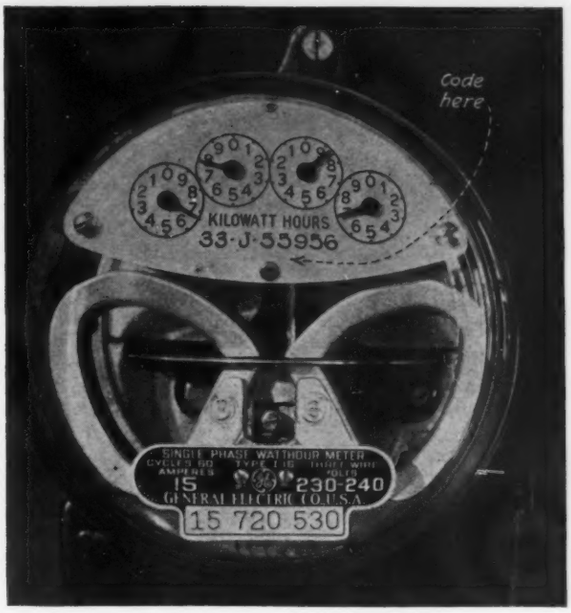
The letters SP preceding all other parts of the code indicate a multi-circuit meter.

The letter D preceding all other parts of the code indicates a four-wire delta meter.

Demand type registers are indicated by adding the proper letters to the type code, as: GE Type M-20 code M. Sangamo Type HG code HG. W'h'se Type RW code WR.

Meters equipped with contacts for operating demand meters are identified by adding the letter W to the type code.

Space for code may be on nameplate



Code lettered on register face

letter or a group of letters and numbers. Each meter type is assigned its letter or group. For example, a General Electric Type 1-14 is identified by the letter X, Type D-6 by the letter E.

Where possible, the code letter is the same as the manufacturer's type identification. The Westinghouse Type OB is coded OB, Duncan MD is coded MD, etc. This practice was not followed with General Electric meters because it so happens that the manufacturer's style of type identification uses several numbers that are likely to be confused with the numbers used in the code for current and voltage identification.

Ratings and connections identified

Current and voltage ratings of the meters are shown by a number having two parts. The first part indicates the current, while the second indicates the voltage, and, in some cases, the number of wires in the circuit where the meter may be used. For example, an 11-X-50,000 meter is a 5-amp., 110-volt General Electric Type 1-14 meter with Oklahoma Gas & Electric company number 50,000. The number 11 in the code is the indication for a 5-amp., 110-volt meter. The first 1 shows that the current rating is 5 amp. For each 5 amp. increase in the current rating of the meter the current number in the code is increased by one; 21-X-50,000 indicates a 10-amp., 110-volt meter and 31-X-50,000 indicates a 15-amp., 110-volt meter.

It is to be noted in the examples just given that the second 1 remains unchanged, indicating in each case that the meter is for 110 volts. A 12-X meter would be a 5-amp., 220-volt, two-wire meter, a 13-X meter would be a 5-amp., 220-volt, three-wire meter and a 14-X meter would be a 5-amp., 440-volt, two-wire meter. By referring to the tabulated code we see that the digits that indicate the voltage have been chosen arbitrarily to show the voltage and, in some cases, the number of wires. The voltage digit alone will not always give positive indication of the number of wires, but the combination of the voltage digit and the code for the meter type will tell the number of wires. For example, an 11-X is a two-wire meter, General Electric Type 1-14, while an 11-E is a three-wire meter, General Electric Type D-6, and an 11-Y is a four-wire meter, General Electric Type D-15.

When the voltage code requires more than one digit the current and voltage indicating number is written in this way, 20 $\underline{20}$. The first 20 indicates that the current rating is 20 times 5, or 100 amp. The second 20, which is underlined, is the number which has been chosen to indicate a voltage of 63,000. This method of writing eliminates a chance for confusion that would be present if the current and voltage sections of the number were not separated whenever the voltage section has more than one digit.

In order to identify transformer type meters the letter Y is placed at the beginning of the code group. Immediately following the letter Y is a digit to indicate the voltage rating of the meter potential coils; Y1 indicates a transformer type meter with 110-volt potentials; Y2 indicates a transformer type meter with 220-volt potentials, while Y3 indicates 440-volt potential coils.

Y1-207-OB-25492 indicates a Westinghouse Type OB meter for use with instrument transformers, meter potential coils rated at 110 volts, and the meter is being used on a 100-amp., 2,300-volt, three-wire circuit. Y2-2003-L-57843 indicates a General Electric Type D-14 for use with instrument transformers, meter potential coils rated at 220 volts, and the meter is being used on a 1,000-amp., 220-volt, three-wire, three-phase circuit. Y3-504-X-37283 indicates a General Electric meter, Type 1-14, for use with instrument transformers, meter potential coils rated at 440 volts, and the meter is being used on a 250-amp., 440-volt, two-wire circuit.

Meters for use on four-wire delta circuits are identified by the letter D preceding all other parts of the code. D-53-L-52907 indicates a 25-amp., 220-volt, four-wire delta meter. DY2-803-L-55973 is a transformer type meter on a four-wire delta circuit.

Multi-circuit meters for combined metering of a three-wire, single-phase circuit and a three-wire, three-phase circuit are identified by the letters SP preceding all other parts of the code. SP-103-HF3-738873 indicates a San-

[*Continued on page 126*]

What Does It Cost to Sell Ranges?

A Power Company Sales Executive Asks Some Questions - Here Are Some Answers

AN EASTERN power company sales manager wrote us recently about the cost of selling ranges. He said: "An analysis of 152 installations shows the average consumption of these customers, for twelve-month periods, was 964 kw.-hr. more after installation than before the range was purchased. At an average rate of 2.22 cents this means an increase of only $21.40 annual revenue. We have been estimating a range as worth $36 a year in revenue. We suspect that this average figure is too high."

He then proceeded to ask four questions:

1. How much estimated annual revenue do the most successful companies credit to range sales?

2. How much actual increase do they find after a year?

3. What is the merchandise and new-business loss per customer when you include all charges—installation, free servicing and repairs, home demonstrations, advertising and other expense.

4. Do other companies consider the increased cost of distribution systems resulting from intensive range campaigns? What do they figure it per range?

These are pertinent questions. They were, therefore, submitted to a selected group of utility companies, that reported the largest range sales in 1935, in the survey of appliance merchandising published in ELECTRICAL WORLD of March 14. Their answers are presented in the accompanying table. Some had complete figures, some could only estimate, some had no basis for precise opinion, but much of the experience reported is of interest. They make the following comment:

COMPANY 1—In order to determine the revenue actually received, we asked the managers of twelve of our divisions to analyze the accounts of a representative number of customers who had been using ranges for at least a year, in urban and rural districts. In each case no other major appliance had been installed during the period. They reported:

Number of accounts analyzed	398
Average annual kw.-hr. used before installation	661
Net average annual revenue before installation	$28.48
Average rate before installation, cents	4.31
Average annual kw.-hr. after installation	2.091
Net average annual revenue after installation	$57.24
Average rate after installation, cents	2.74
Increase in kw.-hr. for range	1.430
Increase in revenue from range	$28.77
Average rate for increased use, cents	2.01

We have always been concerned about the increased cost of distribution facilities required for electric ranges. Reinforcing jobs in the early days might cost as much as $1,000. Today they average about $163. The average cost per range *sold* today is $23.50, because each reinforcement job will also take care of several other ranges in that vicinity. We think electric range business is profitable.

COMPANY 3—Studies based on a five-year program for range development have brought out these figures on distribution cost:

1936	between	$17	and $18
1937	between	21	and 22
1938	between	26	and 27
1939	between	30	and 31
1940	between	34	and 35

COMPANY 4—Our 1935 cost per range, based upon 6,881 ranges, was $80.29, which included:

	Cost
Free installation	$38.94
Free estimating and inspecting	5.86
Free servicing and repairs	7.83
Home demonstrations	5.51
Range advertising	4.74
Miscellaneous other expense	17.41
	$80.29

The margin of profit realized on the merchandise can be estimated at about $5 per range.

COMPANY 5—Our total cost at present is about $62 per range, the highest expense we have ever incurred, due to the inauguration of a greatly intensified program. This includes:

Free wiring.

Free servicing for one year on ranges sold by company and dealers.

The use of our service department by dealers thereafter on a cost basis.

The use of our home service department, free to dealers for conducting meetings, demonstrations, sales assistance and follow up.

All advertising, including a large volume for the benefit of dealers.

Financing of dealer sales on the same basis as company sales.

Dealer bonus, whereby one range is given to the dealer free for each five he sells.

Allowance of $10 on all old ranges taken out by dealers and returned to us to be junked.

Increased capital investment and distribution system costs are not operating expenses. With increased saturation this capital expenditure per unit has been reduced to between $30 and $40 per unit, including large size meters, services, etc. This compares with a figure of around $150 per unit, years ago when few ranges were sold.

COMPANY 17—Figures on 121 customers showed the increase to be 1,513 kw.-hr. per customer for all year-round customers and 566 kw.-hr. per customer for 36 typical seasonal customers. The following breakdown was found:

17%	average	635	kw.-hr. per year
12%	average	912	kw.-hr. per year
12%	average	1,098	kw.-hr. per year
20%	average	1,343	kw.-hr. per year
20%	average	1,716	kw.-hr. per year
14%	average	2,229	kw.-hr. per year
5%	average	2,778	kw.-hr. per year

The first three brackets probably use fuel ranges for heating the kitchen during the winter time.

Our sales expenses are:

Advertising	$6.00
Salaries and commission	20.00
Supplies and expenses	1.00
Demonstrations	4.00
Wiring allowance	15.00
Delivery and stores exp.	7.00
One year free service	2.00
Total expense	$55.00

Our average capital investment per range is:

Distribution transformer	$8.00
Service to house	6.50
Meter	2.00
Primary and secondary enlargements	15.00
Customer's wiring to meter	24.00
Total added investment	$55.50

COMPANY 16—We install a range that costs us about $55, charging the customer about $90, with a deficit of $45 to $50 per range installed. Our range saturation is between 7 and 8 per cent. We renew burned-out range elements without charge, averaging one new element each year per customer at a cost of $2.20.

In 1934 we added 4,980 ranges to our lines and spent about $66,000 for transformer changes to serve them. This is between $10 and $15 invested in transformers for each range added to our lines.

COMPANY 15—In 1933 we made an analysis of 5,400 accounts and found the average consumption was 162 kw.-hr. per month. We assume that 62 kw.-hr. covered the use of small appliances and refrigeration by such customers as had refrigerators and the balance of 100 kw.-hr. was used for cooking. At that time our third block rate was 3 cents and we estimate that these range customers pay an average of 3¼ cents for cooking and produce a revenue of approximately $40 a year.

On April 1 we reduced the third block to 2½ cents and reckon the future annual revenue at this rate in the neighborhood of $28 a customer.

We estimate that it costs us about 37½ cents per $1 of the first year's revenue, in new business and merchandising expense, for each range or water heater placed on our lines. We do not take into consideration any increased cost of distribution system resulting from range campaigns. Our distribution lines, generally, have ample capacity.

COMPANY 9—In 1930 we had several thousand ranges in service, metered separately from the rest of the premises, and 1,015 range meters averaged 1,641 kw.-hr. each.

The average revenue for the year 1935 for all residential customers not having electric ranges was $23.80. The average consumption for range users, including all service in the home except water heating, was 21,189. The average annual consumption for domestic customers not having ranges was 534. This is a difference of 1,655 kw.-hr. per year between range users and non-range users and is a little higher than the figure of 1,641 kw.-hr. determined in 1930.

Our present electric range saturation approximates 23 per cent. Therefore, 77 per cent of our domestic customers used an average of only 534 kw.-hr. during 1935. The use of ranges by the 23 per cent, plus a still lower water heater saturation among range users, brings the average consumption for all domestic customers up to 1,046 kw.-hr. annually with an average annual revenue of $31.61. We figure range revenue somewhere between $34 and $36 annually, predicated on the fact that in many instances a small portion of the range consumption falls at 3 cents per kw.-hr. and the balance at 1.8 cents per kw.-hr. Probably the average rate per kw.-hr. actually enjoyed by our domestic range customers is somewhere in the vicinity of 2.2 cents.

We early adopted the policy when making new line extensions of running primaries and having as little secondary distribution as possible. We now seldom find it necessary to make extensions of primary circuits in order to serve additional ranges. Our distribution department estimates our capital investment, in additional distribution system alone, does not exceed $35 per range, added excluding larger drops and meter. We have a great many installations where several range customers are served satisfactorily from a 5 kilowatt transformer.

COMPANY 6—Our books indicate a net merchandising profit of $15.28 per range, from which, after deducting the charges made to new business for bonuses paid, home service expense and advertising pro rata, there results a final net profit of 14 cents per range or virtually a break-even basis in so far as the actual sale of the range is concerned.

We capitalize the interior range wiring as well as the addition to the distribution system. Using the $30 annual revenue estimated to result from the use of the range and assuming a 50 per cent operating ratio, we estimate that we are receiving $15 per year net earnings per range available for retirement, depreciation and taxes:

Cost of Selling Ranges

Company	Saturation Per Cent	Estimated Kw.-Hr. Consumption	Estimated Revenue	Average Rate, Cents	Cost to Mdse. Exp.	Cost to Dist. Sys.
1	10	1,430	$28.77	2.74	.....	$23.50
2	2.4	1,300	39.60	3.00	$72.32	40.00
3	21.6	.....	24.00	2.50	.....	17.50
4	2.6	1,440	34.60	2.40	80.29	.....
5	8.	1,280	26.00	2.13	62.00	35.00
6	15.9	1,500	30.00	2.30	.....	75.00
7	2.9	1,320	32.00	3.50	.....	40.00
8	....	964	21.40	2.22	40.00	.....
9	20.8	1,655	32.82	2.20	.....	35.00
10	18.1	1,513	44.28	2.30	55.00	55.50
11	7.8	1,302	31.98	2.50	50.00	15.00
12	3.6	1,285	22.45	2.20	.....	31.34
13	2.8	.....	41.35	3.90	.....	16.75
14	17.	.....	33.96	2.90	.....	.....
15	.....	1,200	28.00	3.20	15.00	.....
16	6.2	1,302	31.98	2.80	50.00	15.08
17	10.1	1,513	44.28	3.20	55.00	55.50

Merchandise Expense	Average % of Selling Price	Average per Range
Handling expense	6.97	$7.52
Direct selling expense	18.60	20.10
Acct. and collection expense	2.62	2.83
Repossession losses and uncol. accts.	2.10	2.27
Total mdse. expense	30.29	$32.72
New-Business Expenses (applicable to range sales)		
Employee's bonus on 80% of sales		1.60
Salesman's bonus		4.00
Supervisor's bonus		2.00
Home economists		2.32
Advertising pro rata		5.22
Total new-business expense		$15.14
Investment Capitalized		
Range wiring (interior)		$26.00
Additions to distribution system		75.00
Total added investment		$101.00

The general sales manager of one of these companies who has been long in the range business said: "You can certainly ask the damnedest questions of anybody in the industry." It was said politely and we take it kindly, but the fact remains that there is need for much more light on this matter of range sales costs. Out of the seventeen power companies represented in the tabulation, eight could make no definite statement as to the expense involved in the charge to merchandise and new-business accounts, four had no information as to the exact cost of a range in added distribution expense.

These figures make no pretense of being comparable. Local range saturation, local sales methods, local rates, all tend to make it difficult to say which company is doing the best range-selling job. Different methods of accounting make it impossible. But it gives just one more evidence of the great need for more uniformity in merchandise accounting practice among the power companies, so that men may be able to measure their own performance against the records of other cities and get some help from it.

Annual Supplement, 100,000,000-Kw.-Hr. Systems

FOR many years the annual supplement giving statistics on the operations of large electric light and power systems has been a feature of ELECTRICAL WORLD. A survey of such operations in 1936 is now in progress. Requests for data have been sent to all companies known to be in the 100,000,000-kw.-hr. class, and many returns have been received. Every day's mail brings added evidence of fine co-operation on the part of the industry.

As soon as all reports are in hand the material will be compiled, analyzed and published. The data will include plant capacity, energy output, kilowatt-hour sales to various classes of consumers and number of consumers in each class. The publication date has been tentatively set for May 8. It may be advanced if the remaining returns are received promptly.

Hints on Uses of Photo-Electric Counting

By H. A. DELIUS

California & Hawaiian Sugar Refining Corporation, Ltd., Crockett, Calif.

Experience gained in service has demonstrated the versatility of the photo-electric tube. One of the most important applications of this comparatively new industrial tool is checking production and counting products. The author, in this article, recounts application experience gained in adapting photo-electric devices to the production problems of one of the largest sugar refineries in the United States and, by describing an ingenious selective counter, presents a glimpse of the potential field of service that these devices can be expected to dominate.—THE EDITORS.

PRACTICALLY all of the raw sugar handled by this refinery comes from the Hawaiian Islands, being shipped by steamer in 100-lb. jute bags and entering the process in this form.

The refined product leaves the plant in various forms and grades of sugar and in a variety of packages. Consequently, to keep a close check on the refining process and also to maintain a continuous inventory of the refined stock, it is evident that an accurate count of all packages entering and leaving is essential.

After years of experience with the idiosyncrasies of mechanically and hand operated counters, the photo-electric relay and electric counter were welcomed. At present there are 32 light relays on duty 24 hours a day counting products going to and from the refinery.

Although the "electric eye" is superior to any other known device for counting packages as they are transported on conveyors or passing down chutes, there are several things that must be given careful consideration in their application to insure an accurate count:

First—Provision must be made to secure and maintain adequate separation between packages. On the face of it, this appears almost elementary to mention. However, experience has shown that this one point may either make or break an otherwise successful counting installation. When packages come from a packing scale or similar device, which delivers them at uniform intervals, the situation is ideal, but even in this case the light relay should be placed close to the point of discharge so as to avoid difficulties from packages sticking in chutes or along conveyor side boards. Where bags or packages are delivered indiscriminately, some form of mechanical stop, speed-up conveyor or similar device must be provided ahead of the counter to place a definite gap between the units.

Second—The location of the light beam must be carefully selected so that the package positively intercepts and re-establishes the light beam without any chance of flicker. For example, it has been found that the ears on a sewn bag bouncing along on a poorly supported belt conveyor will sometimes flick several times across the beam and register a number of false counts before the bag definitely actuates the relay. In one installation, where bags are counted as they drop off the end of a belt conveyor, a sizable error was introduced by lumps of sugar from damaged bags falling across the light beam. This was overcome by reducing the sensitivity of the relay so that it would operate only when the light beam was completely intercepted by objects on the conveyor.

Third—The human race seems strangely attracted by the pencil of light across the path of the bags or packages and few persons can resist the temptation to pass their hands through it just to see what happens. The resulting error in the count calls for adequate guards or the placing of the equipment in a location where the beam is not readily accessible.

Fourth—If the count is important, it is desirable to install two light relays either connected to a single electric counter or to separate counters. The latter is the preferable method. Tubes burn out and other parts give trouble from time to time and duplicate units will insure against loss of the count from these causes. A neon glow lamp in parallel with the counter is a good investment as its flashes give continual visual evidence that the equipment is functioning properly.

One novel counting installation is

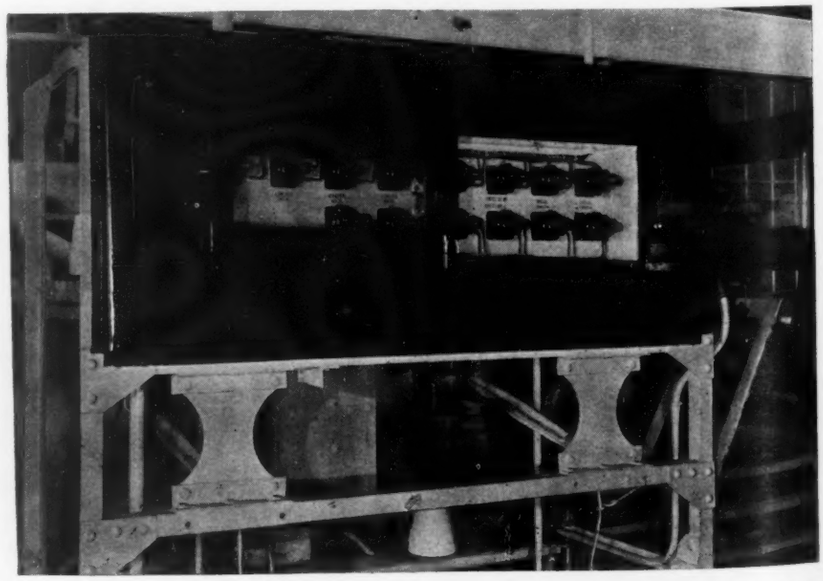


Fig. 1—Group of fourteen electric counters actuated from photo-electric relays
These count small bags of sugar 2 lb. to 25 lb. in size as they drop down chutes from the filling and sewing machines on the floor above to tables in the background, where they are packed in bales for shipment.

shown in Fig. 2. Here 100-lb. bags are counted as they leave the automatic packing machine (Fig. 3). This packer is arranged to pack two different brands of sugar simultaneously. It is the duty of the counter installation to count the number of bags of each brand packed.

Properly to understand the manner in which this counter functions, a description of the operation of the automatic packing equipment is required. It is evident from Fig. 3 that this machine consists essentially of two continuous conveyors operating in synchronism—one of which carries hoppers to which the empty bags are attached and the other steps or perches onto which the filled bags are set. In the foreground are the bag-hanging stations. Here two operators place the empty bags on the hoppers and secure them in place with solenoid-controlled clamps. The hoppers and bags then pass under a battery of six automatic scales. Each scale is tripped in sequence electrically at the proper time to deposit its load of sugar into every sixth hopper. This is accomplished through the agency of a timing cam driven from the hopper conveyor.

Interlocks are provided so that if a scale is not filled and balanced, or if there is no bag on the proper hopper, it will not dump. The filled bags pass through a battery of paddles which compact the sugar and are then released from the hopper and set onto the step conveyor automatically. This conveyor carries the bags to the sewing machines for closing them and then past the counter installation, after which they are dropped down a chute onto a belt conveyor which delivers them to storage.

In building a counter to fulfill the requirements of this installation use was made of a timing cam similar to the one that controls the dumping of the scales, to actuate the counters in the same sequence as that in which the scales are dumped. As each scale dumps into every sixth hopper, it follows that every sixth bag passing the counter will have come from that scale. As the timing cam is geared to the conveyor and there is a fixed distance between the bags filled by the same scale it is only necessary to set the cam to synchronize the passing of the filled bags with the dumping of the scales. All that is then necessary is to provide a double-throw switch to transfer the impulses of the

[*Continued on page 130*]

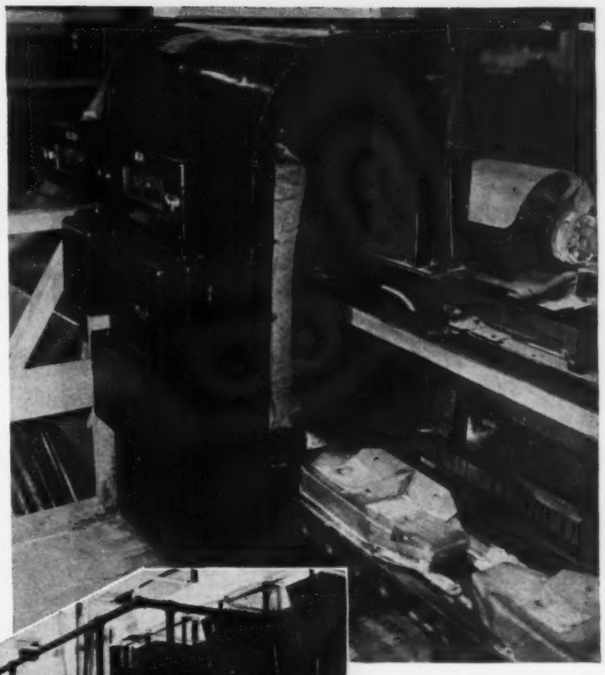


Fig. 2—Double interlocking photocell counter for counting two brands of bag sugar

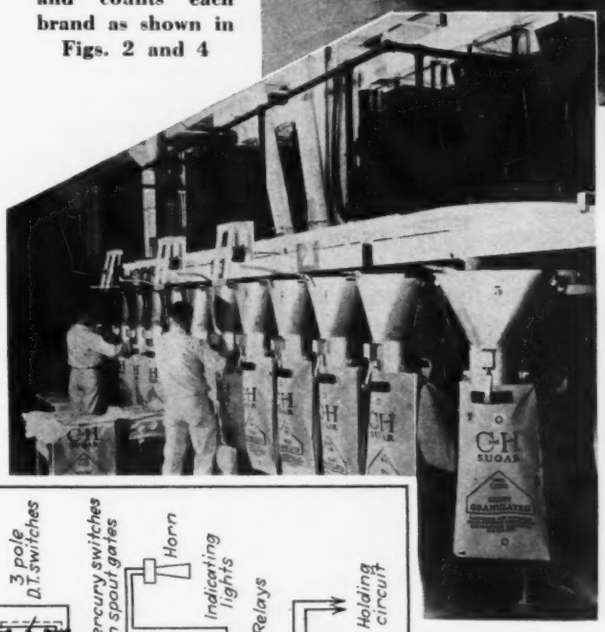


Fig. 3—Automatic 100-lb. bag packer packs the two brands of sugar and counts each brand as shown in Figs. 2 and 4

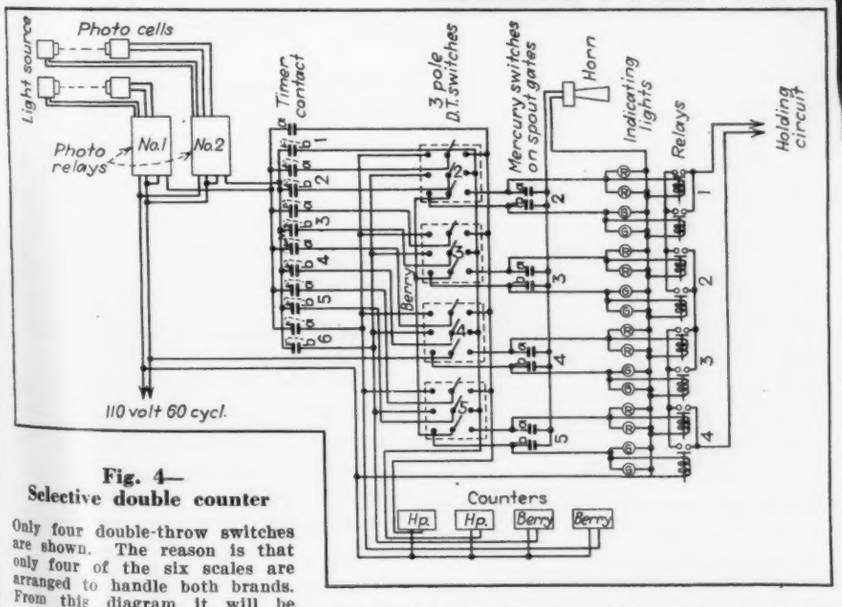


Fig. 4—Selective double counter

Only four double-throw switches are shown. The reason is that only four of the six scales are arranged to handle both brands. From this diagram it will be seen that the contacts of the timing cam are in series with those of the photo-electric relay so that it is necessary for a bag to be intercepting the light beam when the timer establishes the proper contact before a count is registered. Originally the photo-electric relay operated the counter directly, the contacts on the timing relay remaining closed for the entire period during which the bag was passing the light beam. However, it was found that when the packer was stopped, occasionally it would come to rest with just the edge of the bag intercepting the beam. The movement of the bag in coming to rest and during the subsequent start proved sufficient motion at times to ring up a whole series of false counts on one counter. This condition was overcome by having the photo-electric relay maintain the circuit and allowing the contact on the timing cam to complete the connection momentarily when the bag was approximately centered on the beam. This arrangement has proved to be very reliable under all operating conditions.

Astatic Relay Keeps Voltage Regulated

Gravity Principle Affords Large Power Without Hunting or Temperature Variation but With Inverse Time Response

By E. T. NORRIS
Chief Designer Ferranti, Ltd., Hollinwood, England

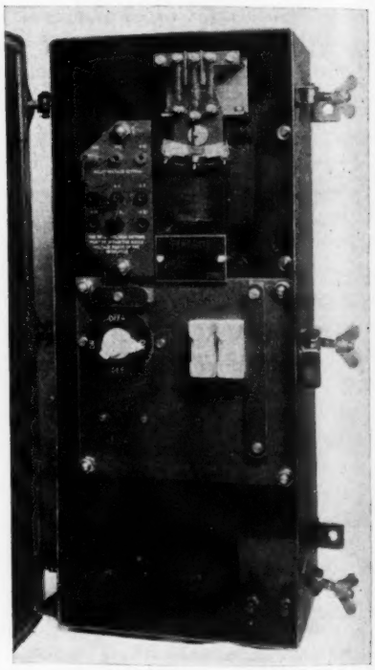
CONTACT-MAKING voltmeters have remained a relatively delicate instrument needing skilled adjustment and periodical maintenance. The most objectionable features of the contact-making voltmeter have recently been eliminated in a new invention known as the astatic voltage relay.

The function of the contact-making voltmeter is to close a motor circuit, directly or indirectly, whenever the voltage varies a prescribed amount (usually 1 per cent or less) from the normal value and so initiate operation of the regulator in the direction necessary for correcting the variation.

In the ordinary relay or contact-making voltmeter the electromagnetic forces actuating at normal voltage are balanced against a spring suitably adjusted in tension. The small voltage variation permissible results in a net operating force which is only sufficient to close a pair of light open contacts—auxiliary relay circuits and starting contactors being necessary to control the regulator motor. These delicate contacts require periodical cleaning and adjustment.

Moreover, in order that contact, when it occurs, shall be positive and under pressure, to prevent chattering and arcing of the electrodes, a hold-on device consisting of auxiliary coils or magnets is necessary. The hold-on effect depends on the sensitivity and needs skilled adjustment and maintenance. If too small the contacts will chatter and rapidly burn away, while excessive hold-on will cause hunting (*i.e.*, continuous oscillation). As a further disadvantage the controlled voltage depends on the balancing spring adjustment. The unavoidable creepage with time in springs under tension results in a gradual raising of the voltage and the risk of damage to lamps and domestic apparatus unless the adjustment is periodically checked.

The new relay comprises an electromagnetic circuit of special design in which the force exerted in the moving element or armature at a given voltage is constant over a large range of movement and operates against the weight of the armature due to gravity. If the circuit is so arranged that, at normal voltage, the force is exactly equal to the weight of the armature, then the effect of gravity is neutralized and the armature tends to no particular position, hence the name "Astatic" relay. Under these conditions the armature will remain permanently in any set position. If it is forcibly raised or lowered by hand to another position it will stay equally in that position until further disturbed.



Voltage variation actuates a pendular mercury switch to start motor for shift of regulator coil

In earlier articles (August 18, 1934, page 202, and March 14, 1936, page 70) a new moving-coil type of voltage regulator was described in detail. It is now serving on circuits of from 2 to 15,000 kva. To realize on all its advantages called for a form of actuation that could circumvent the delicacy of prevailing contact-making mechanisms. The author describes what he has devised as an alternative.

Greatly amplified force obtained

The mechanical forces on the armature are approximately proportional to the square of the voltage. If, therefore, the voltage rises say 1 per cent the force on an armature of weight W pounds will increase 2 per cent or 0.02 W pounds. Since the weight of the armature is neutralized this additional force of 0.02 W pounds has nothing to do but overcome the negligible friction of the armature movement and can be utilized for external work. Owing to the astatic action the extra force 0.02 W will be constant over a considerable movement M, giving a useful work output of

$\pm 0.02\ WM$. As both W and M can be made of any desired magnitude, relatively large outputs can be obtained. Values chosen for the new relay standard model are such that the energy available for operation due to a 1 per cent change in voltage is, by actual measurement, 480 times greater than in the ordinary relay. Because of this extra power it is possible to operate a heavy-duty mercury switch with ease instead of closing a pair of light and relatively delicate contacts. This switch is of the two-way, three-electrode type, mounted in clips on an insulation plate. The pendulum action due to the weight of the switch determines the neutral position at normal voltage. The switch movement is shown in an accompanying illustration.

Use of mercury switches eliminates burning or wear of contacts and also hold-on coils or other devices to prevent chattering, as, due to the meniscus action of the mercury, both make and break are complete and instantaneous. The meniscus action also causes the tilting angle of break to be less than the angle for make. The difference is an inherent characteristic of the switch and results in correction of voltage variations to values well within the sensitivity range. Hunting is therefore impossible. The rupturing capacity of the switch is such that large motor loads can be handled directly, so that auxiliary relays and starting contactors are unnecessary.

Ballast resistance eliminated

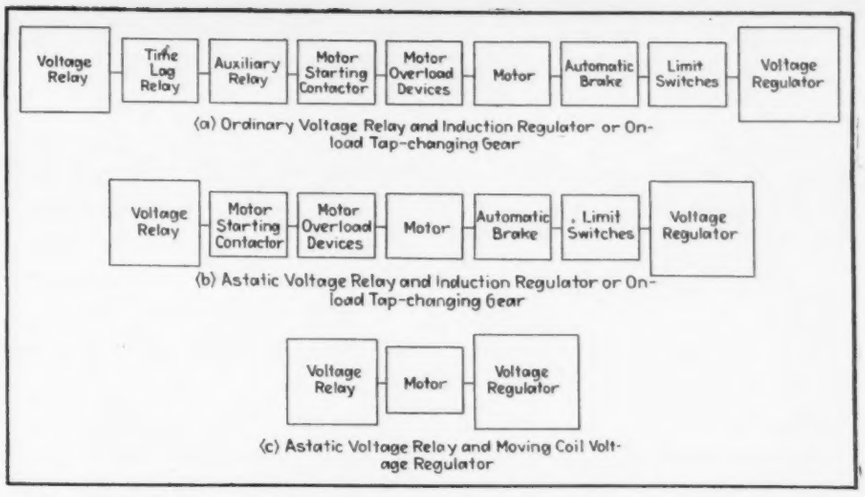
In many ordinary relays a large series resistance is necessary for stable operation. One of the functions of this resistance is to eliminate the effect of temperature on the voltage setting. In other cases bimetallic strips or other temperature-compensating devices are incorporated in the relay assembly.

The astatic voltage relay is independent of temperature variations over any range experienced under both arctic and tropical conditions. Temperature compensation is unnecessary and no series resistances or reactances are required.

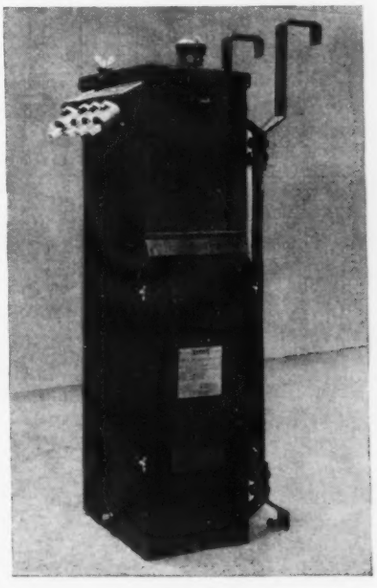
In some types of voltage regulator, and particularly in on-load tap-changing gear, time-delay relays are included in the control circuit to avoid numerous operations due to transient voltage variations by delaying action until a definite time has elapsed. These relays are, for economy, designed with adjustable but fixed values of time lag. It is, however, obviously desirable that the relays should have an inverse time element characteristic (*i.e.*, that the time delay for large voltage changes should be less than for small variations).

Such an inverse time delay can be incorporated automatically in the astatic relay by merely damping the movement of the plunger. The small amount of friction and damping present in the normal construction provides an inverse time element sufficient to prevent unnecessary operation due to momentary voltage kicks. By increasing this damping the inverse time lag may be accentuated to any desired extent.

If the relay coil should become de-energized the ordinary relay will close in the low-voltage position and boost the regulated voltage to the maximum value. To prevent this danger a low-voltage cut-out device is frequently fitted. In the astatic relay this cut-out effect is obtained by merely arranging the low-voltage stop of the relay so that the mercury switch is tilted far enough to break contact from the middle electrode. In this way protection is automatically provided, with no complication or auxiliary mechanism.



Of conventional regulator accessories the astatic relay eliminates all but the indispensable motor



Astatic voltage relay controls pole-mounted moving coil voltage regulator

Rating 50 kva., 240 volts, 9 per cent boost to 6 per cent buck

Only two adjustments required

The new relay can be used to replace existing relays in most types of automatic voltage regulator, including ordinary induction regulators. The only adjustments necessary are those for operating voltage and for sensitivity. The former is easily determined in service by a wander plug and a terminal board marked directly in voltage values. Since the voltage at which the relay is balanced depends only on the weight of the plunger, and not on spring tensions, the settings have the same reliable constancy as gravity. The sensitivity for any given regulator can usually be set, once for all, at the manufacturer's works before despatch. It can, however, easily be changed in service by varying the pendulum action of the switch movement. No hold-on adjustment is necessary.

The astatic relay requires no peri-

[*Continued on page* 132]

Utilities Set New Records

Energy sales in December were 16 per cent above 1935, revenue 7.9 per cent—Large gain in industrial use

DECEMBER operations surpassed all previous records in the history of the electric light and power industry, both as to revenue and as to the amount of energy generated. The former amounted to $187,094,000, according to the Edison Electric Institute, and surpassed the revenue for the like month in 1935 by 7.9 per cent. The previous record month was January, 1930, with $185,322,200.

Energy production of 9,859,400,000 kw.-hr., 15 per cent more than a year ago, topped the previous record established two months before by 2 per cent and overshot the pre-depression maximum (also in January, 1930) by 21 per cent. The figures are significant—revenue only slightly greater than it was seven years ago, but the amount of energy that had to be produced to get that revenue increased by more than a fifth.

Production from fuels also rose to a new record of 6,544,900,000 kw.-hr., 18.7 per cent more than in December, 1935, but only moderately above the amount in October, 1936.

Regionally the Southeast led the rest of the country in terms of gains compared with a year ago, with an increase of 16 per cent in revenue and 20 per cent in energy production, and the Pacific states were lowest with 3.6 and 5.2 per cent, respectively. In other sections the rise was approximately the same as in the country as a whole, but the relative changes in production from fuels and from water power varied widely, as is evident from Table II.

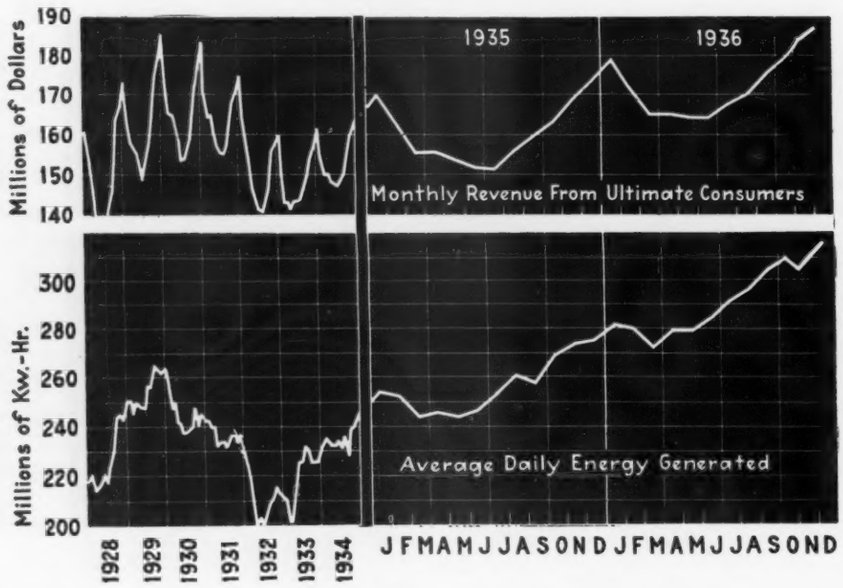


Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1936	Revenue from Ultimate Consumers‡		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
December	187,094	+7.9	9,859	+15.0	3,314	+8.0	6,545	+18.7
November	183,066	+8.1	9,171	+11.8	3,033	—0.7	6,138	+19.1
October	179,972	+10.6	9,639	+15.3	3,137	+17.6	6,502	+14.2
September	175,597	+10.4	9,177	+18.8	2,736	—2.2	6,441	+30.5

Table II—Regional Revenue and Energy Output in December, 1936

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ultimate Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	187,094	+7.9	9,859	+15.0	3,314	+8.0	6,545	+18.7
New England	16,263	+6.8	687	+15.0	305	+36.0	382	+2.5
Middle Atlantic	53,838	+7.5	2,538	+15.4	683	+3.4	1,855	+21.0
East No. Central	43,463	+6.0	2,492	+18.0	156	—7.8	2,336	+20.0
West No. Central	15,835	+8.8	605	+8.2	86	—43.6	519	+28.0
South Atlantic, East So. Central	25,284	+16.1	1,256	+20.8	703	+36.3	553	+5.5
			386	+18.5	289	+11.3	97	+46.0
West So. Central	9,813	+7.1	450	+13.0	25	—12.2	425	+15.2
Mountain	5,471	+6.5	330	+17.0	217	+12.2	113	+26.8
Pacific	17,127	+3.6	1,115	+5.2	850	—0.7	265	+30.5

* By courtesy of Federal Power Commission, with deductions for operations not regarded as central station.
‡ Edison Electric Institute.

Industrial use far above 1936

Kilowatt-hour sales to ultimate consumers were the highest ever recorded and 16 per cent greater than a year ago. Stimulated by the growing activity of industrial plants, wholesale commercial sales advanced 23.1 per cent over last year, but remained under the all-time peak of last October. Increased electrical operation brought a 45 per cent increase in sales to railroads. Energy sales for domestic service, up 8.3 per cent, and retail commercial, up 10.3 per cent, both exceeded previous records by small margins.

Table III—Allocation of Energy December, 1936

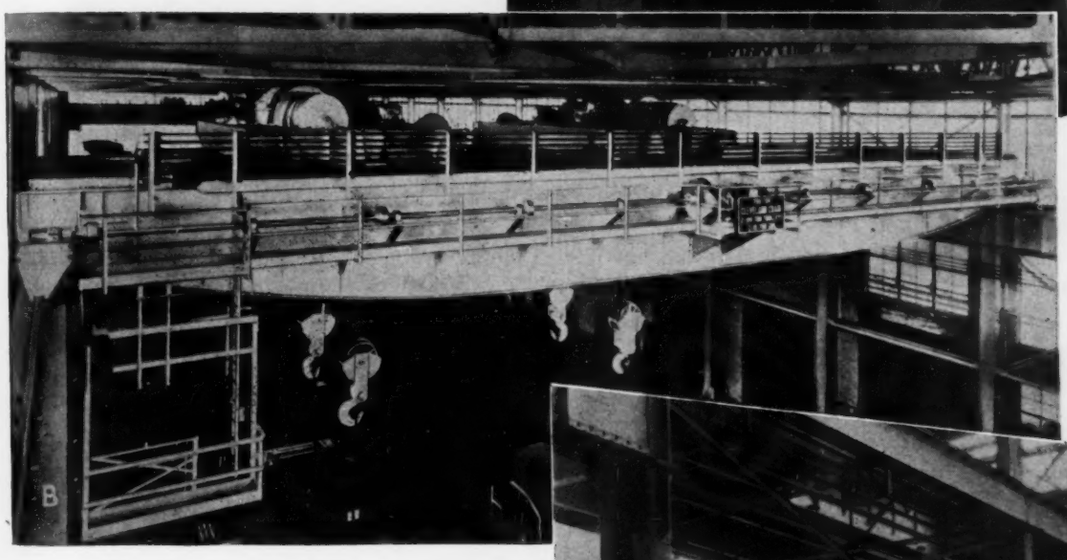
Compared with Corresponding Month of Previous Year
(Edison Electric Institute)

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	9,850	+15.6
Lost in transmission, etc.	1,697	+13.7
Sold to ultimate consumers	8,153	+16.0
Domestic	1,482	+8.3
Com'l, small light and power	1,501	+10.3
Com'l, large light and power	4,298	+23.1
Municipal street lighting	235	+3.3
Railways—street, interurban	433	—1.2
Railroads—electrified steam	124	+45.0
Municipal and miscellaneous	80	+43.5

* Generated, purchased from other sources, imported, less energy used in railway and other departments.

Variety Spices Life of the Electric Welding Engineer

A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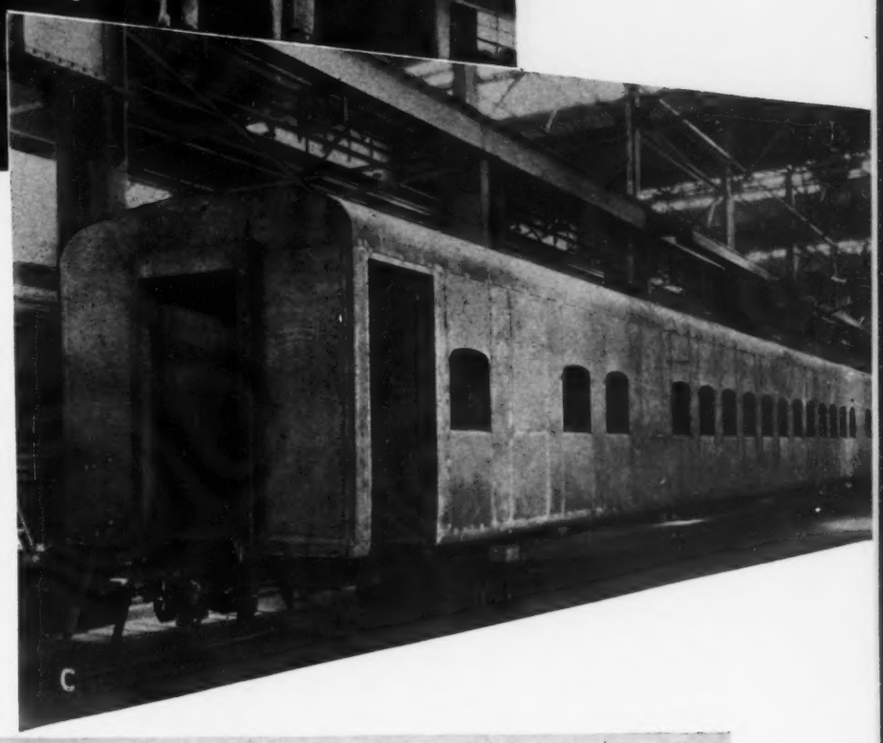
Photos
Lincoln Electric Company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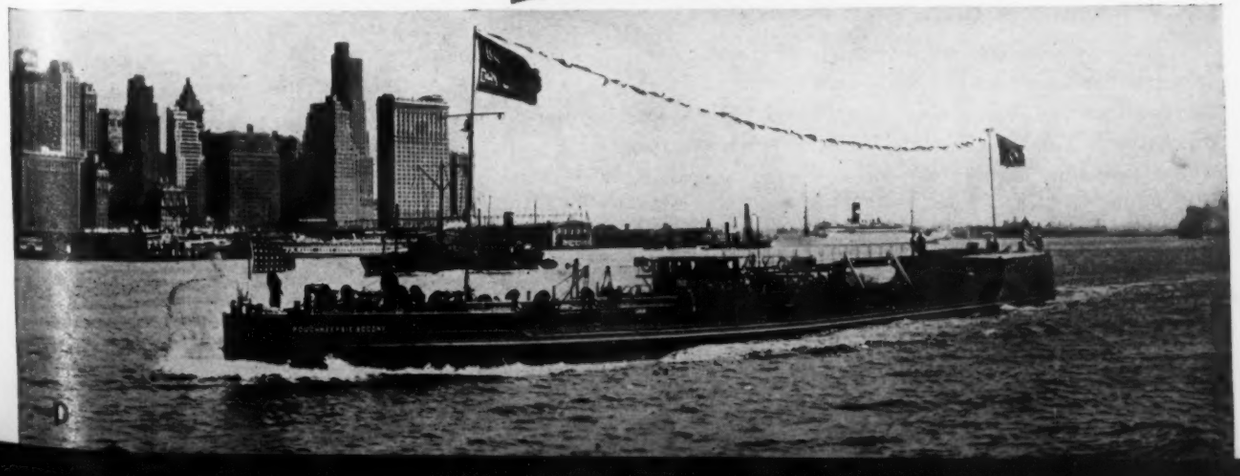
Mass production of welds features the fabrication of automobile mufflers (A) at the rate of 250 per hour plus high economy of space. A 200-ton crane (B) of arc-welded construction is the electrical Ajax of a Diesel engine factory minus the usual complement of rivets. Turning to the rails, 50,000 lb. was saved in the design of this modern passenger coach (C), electric welding being an important factor in this economy, and "going marine," this tanker, *Poughkeepsie Socony*, is enabled to make a "free trip" every year or so because 50 tons dead weight was cut out of her design, many extra connecting members being eliminated as well as sludge pockets with their corrosive potentialities, calking done away with and painting made easier.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Editorials

HOWARD EHRLICH . EDITOR

Toward Higher Voltage Joint Use

FRESH fruit has come from the co-operative efforts of Edison Electric Institute over the years to solve mutual problems encountered in providing better and better power and communication facilities to the public. At present these public service industries use five million poles in common and each of these five million instances of proximity presents a problem that no one not familiar with engineering, construction and operating details would realize.

One late result of this co-operation is the joint report entitled "Specifications for the Construction and Maintenance of Jointly Used Wood Pole Lines Carrying Supply and Communication Circuits" (E.E.I. No. E-3). The significance rests in the presentation of methods which are destined to be of substantial advantage in rendering power and communication service. Those who are familiar with the earlier specifications known as A.T.&T. No. 4864 and the still earlier No. 4040 will find that the new set-up takes advantage of improvements and new materials made available for both power and telephone systems.

Another accomplishment is the related joint report which discusses co-ordinative measures developed for use in certain situations where joint use between telephone circuits and 6.6- and 13.2-kv. power circuits is proposed. Provisional Report No. 19 of the joint subcommittee on development and research of E.E.I. and Bell System (E.E.I. No. E-4) embraces these details and demonstrates clearly that the voltage of the power systems is not the determining factor in safety considerations. On the contrary, the element of safety hinges on frequency of occurrence of contacts between the circuits, on the voltage that might be impressed on telephone plant in the event of accidental contact with the power wires, on the possible duration of the voltage on telephone plant after an accidental contact and on the possible magnitude and character of current in the telephone plant following contact. Here is presented a sound basis for determining whether joint use should be entered into with these higher distribution voltages.

These two reports are a testimonial credit to two industries amicably settling somewhat antithetical service requirements when they might well, under less conciliatory atmosphere, take arbitrary stands that would result in higher cost for no better service to the public.

Discreditment of State Regulation

THE Maltbie-McNinch controversy is the culmination of designing attempts on the part of government agencies to discredit state regulation as ineffective and dominated by utility interests. Dual control in regulation and jurisdiction is not only cumbersome, costly and inefficient but it naturally leads to an attempt at bureaucratic domination. For that reason it is not unlikely that, as federal commissions assume greater powers and jurisdiction over the nation's utility industry, other state commissions will find themselves subjected to attack.

Determination of the fairness of utility rates is a highly technical process in which careful consideration is given to the cost of operation, taxation, valuation of property and the character of, and demands for, service. Comparisons of rate schedules in different cities or sections of the country are not in themselves proofs of reasonableness of cost of service. Loose expressions concerning the utility industry, its rates and operations can, in many instances, but lead to unjustifiable public discontent. Assertions and expressions of opinion concerning such intricate subjects had better never be said unless backed by exacting and substantiating proof.

If, as we have been led to believe, federal and state regulatory bodies were created to protect the best interests of both the consuming and investing public then it would seem that the interests of the public would be best served by co-operation between these regulatory commissions. Sniping through headlines in the public press has never been a very satisfactory way of bringing about such co-operation.

•

Rural Service and Highway Lighting Not Yet a Team

THE idea of hitching together rural service and highway lighting, each one promoting and encouraging the other, is an inspiring conception that undoubtedly will be productive of conspicuous economy and accomplishment when and where it can be applied. But —and in practical application the "but" is most emphatic—the "when" is not now and the "where" will probably be infrequent for some years to come.

The reason for this condition is that the extension of rural service and the need for highway lighting are seldom coincident in time or place. Highway lighting cannot be used as an instrument to facilitate rural service along roads that do not need to be lighted, frequently are not paved nor even improved. And where lighting is needed it cannot promote rural service because there is hardly a main road anywhere where

traffic is really heavy along which the farmers do not already have electric service and have had it for years.

Effective and satisfactory highway lighting is not simply a matter of sticking lamps up on poles already set along the roadside. Road lighting must be competently engineered, installed and operated.

Highway lighting should, and undoubtedly will, be installed at first only where it is most urgently needed, namely, on congested traffic ways close to populous centers. Large sums of money have been, and are being, spent to widen and otherwise to increase the traffic capacity of these roads. To light them will require expenditures trivial in proportion to the costs of the highways themselves, but quite large in relation to costs of contiguous rural service.

There is need and a large field for lighting and for traffic control signals at important highway intersections. Such installations might easily be made as parts of new rural service extensions or fed from existing lines. But highway lighting, considering it as the continuous illumination of long stretches of road, cannot yet be thought of as a happy team mate for rural electrification.

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The Woman's Point of View

WHILE there are other notable instances of women on the directorates of utility companies, to our knowledge the election of Mrs. Kenneth B. Norton to the board of the Westchester Lighting Company is the first time an electric utility has gone outside to get a woman's point of view into its executive thinking. This Consolidated Edison subsidiary operates in a territory that is almost entirely residential. Mrs. Norton has been very active for years in civic club and welfare activities.

There are hundreds of women employed in the industry who contact housekeepers—domestic science and lighting service girls. These women as a rule are well educated, are exceptionally smart and intelligent, but they are hired either to help the customer secure better service out of her electrical equipment or to use more service. It is true that they do bring back the women's point of view, but with respect to service rather than policy. Moreover, these women are employees. They may have ideas, but their work does not place them directly in contact with the executive management of their companies.

In this instance the situation is different. Mrs. Norton can do her company, and through its experience other utilities as well, a real service in translating the women's viewpoint to the company's management. What do women think about rates, or the rate forms or bills, or about public versus private ownership, or about service or personnel or many other things? It makes little difference whether they are right or wrong, they are the customers, their viewpoint must be known if they are to be happily served.

Let us not forget that the light bill comes out of the household expenses. Let us not forget the many agencies that are telling her that the rates of private utilities are too high. Let us not forget that she is almost the only contact that employers have with the residential market—meter readers, cashiers, appliance salesmen, service men.

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Merchandising Is a Matter of Necessity

LEGISLATIVE committees in eight states have currently before them bills to place a ban upon selling, renting, distributing or manufacturing electric appliances. The present anti-merchandising agitation is surprising when consideration is given to the co-operative measures initiated by utilities to pass along to other agencies the responsibilities and profits which follow sound appliance merchandising policies.

There are many utility leaders who are desirous of passing along this responsibility. Already there are more than a score of companies in the United States serving upward of four million customers and yet do no direct merchandising. These companies spent last year 30 cents per customer for advertising and had 801 employees engaged in load-building activities.

The saturations in these companies for refrigerators, ranges and water heaters, of 43, 13 and 6 per cent respectively, are better than national averages of 36, 11 and 4 per cent, respectively. This situation could be utilized to prove that utilities should not merchandise, were it not for the fact that the utilities ceased their direct merchandising after the situation permitted them to pass along the merchandising responsibility.

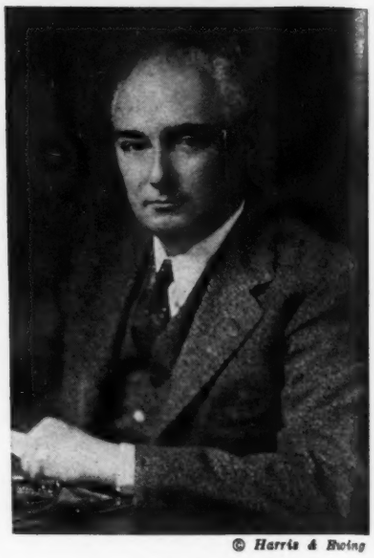
For proof of this statement consider only the fact that utilities sell 69 per cent of the ranges and 82 per cent of the water heaters. Refrigerators now enjoy a consumer acceptance that paves the way for dealers to sell 79 per cent of the total.

All of these facts are evidence of the long-range policy of utilities as a whole to merchandise as long as it may be necessary. It will be necessary as long as no other agency goes out to place the new appliance load on the lines which promotes a greater use of energy, provides the necessary new revenues and thus allows the utility companies to progress in their rate reduction programs.

To any one in possession of all of the facts the conclusion seems inescapable that these sponsors of anti-merchandising legislation should recognize the ill effects upon dealers' business of similar legislative measures ten years ago in Kansas and instead of creating legislative barriers to developing business lend their efforts toward co-operative utility-dealer programs which mean increased business and benefits for all.

Enforced Public Ownership

By CARTER FIELD



© Harris & Ewing

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him.

SAN FRANCISCO affords an illustration of the Roosevelt-Ickes-New Deal attitude toward private ownership of the electric industry, regardless of not only the minorities old-fashioned folk used to think the Constitution was designed to protect, but majorities when those majorities are "out of tune with the times."

A group of would-be Communist agitators was being harangued in a Washington hotel room by a recent arrival from Moscow.

"What do the rich men do?" demanded the arrival. "They smoke big black cigars, and they eat strawberries in January. Comes the revolution—*We* will smoke big black cigars. *We* will eat strawberries in January."

"But, comrade," broke in a literal-minded recruit. "I can't eat strawberries. I break out in a rash."

The Moscow agent glared at him balefully. His lips formed a thin, grim line. After a little, intimidating pause he snarled through his gritted teeth:

"Comes the revolution—*You* will eat strawberries."

So perhaps San Francisco just doesn't know what is good for it and is going to be made to eat strawberries, and like them.

The beginning of the story goes back to 1913, when the Hetch Hetchy bill was making its slow way through Congress. Senator George Norris, then as now a firm believer that private profit is a public menace, aided in getting an amendment tacked onto the bill. This provided that never should any of the power generated in this water project be sold to any privately owned utility.

It seemed reasonable enough at the time. Congress was anxious to protect the public from the interests. It was anxious to save national resources benefits for *all* the people. It was the same Congress which appropriated $50,000 to build the government railway in Alaska, so as to give the little fellow an equal opportunity with the Guggenheims.

San Francisco has demonstrated a certain distaste for private ownership of utilities. It had set up one of the most remarkable publicly owned electric railway systems in the world, with its tracks on Market street—the main street of the town—paralleling the tracks of the privately owned company! And they are still there!

But it turned out that San Francisco was not willing to spend the money necessary to distribute the current Hetch Hetchy provided. It didn't even bother with a T.V.A. "gridiron" system. It simply devised a scheme for getting around the law, selling the current wholesale to the Pacific Gas & Electric Company.

Again and again since Ickes came into office he has sought to upset that arrangement. Again and again he has forced referenda seeking to force the town to borrow enough money to set up its own system. Again and again the voters seemed to think they had other uses for their town's money. They have got federal money to help build their big bridges, and other things, but they still want a lot of things more than a municipally owned electric distribution plant. Subways, for instance.

They did not seem to see the principle involved. Nor did it ever occur, apparently, either to Roosevelt or Ickes to let the San Franciscans have their own way—to seek to correct the situation by amending the law passed more than twenty years ago with the avowed object of protecting these San Francisco electric consumers from private exploitation. That would be a step backward, in the Roosevelt-Ickes philosophy. What did they care about strawberry rashes?

So last Tuesday (March 9) the San Francisco electorate went to the polls again, on a referendum to approve a $50,000,000 bond issue, despite that just recently, and *after* the San Franciscans had repeatedly voted down the idea of buying the local electric company, this company had reduced rates 10 per cent! It is interesting to find the letter of the law so vigorously upheld by the same people who condemn the Supreme Court for not being more liberal in its interpretations of the law.

Government as well as utility lawyers were surprised, not to say shocked, at the President's charge in his Victory Dinner speech that Supreme Court decisions were blocking progress toward flood control and dust bowl remedying. Government attorneys raised their eyebrows because they had been claiming a magnificent victory in the high court's decision in the T.V.A. case. True, that decision had been quite specific in limiting its approval to the sale of electricity produced *incidentally*. But it had never occurred to any of them that the majority of the court had placed any obstacles whatever in the path of flood control or navigation improvement.

The President's specific allusion to the T.V.A. injunction of course could not be tied in with any charge of obstructing flood control, utility lawyers hastened to point out, because in its ukase against any further duplication of privately owned electric *distribution* facilities the injunction of

[*Continued on page* 144]

News OF THE WEEK

Voters of San Francisco Defeat Move for Government Ownership

Reject proposal to issue $50,000,000 of revenue bonds for purchase of facilities of Pacific Gas & Electric — Two other California cities turn down movement to acquire utility properties

Another setback in the movement of government ownership of public utilities was registered this week as voters of San Francisco turned down the proposition to purchase the distribution system of the Pacific Gas & Electric Company.

Following a spirited campaign, in which political pressure from every source, including the nation's capital, was exerted in every direction, voters went to the polls last Tuesday and voted 77,614 to 65,688 against the proposal to issue $50,000,000 of revenue bonds to purchase the properties of the local utility. Secretary Ickes and other proponents of government ownership strongly favored taking over the facilities of Pacific Gas & Electric.

Ickes backs move

Expressing confidence that the voters would carry out their legal obligation to comply with the Raker act by approving the bond issue, Secretary Ickes said that it would provide for the distribution of Hetch Hetchy power. The power has been sold under a "temporary" agreement to the Pacific Gas & Electric Company for more than ten years.

The San Francisco defeat marked the second time in the past two weeks in which California voters have refused to be swayed by those active in the government ownership of utilities movement. Fresno voted against taking over the facilities of San Joaquin Light & Power Corporation. Citizens of Tulare defeated the movement looking toward the acquisition of the distribution system of Southern California Edison Company, Ltd.

Opinion had been expressed in public ownership quarters that favorable votes for the movement on the Pacific Coast would add impetus to the programs now being carried on for the distribution of power from the many federal hydro-electric projects.

•

Private Ownership Wins in California

By an overwhelming margin, which exceeded two to one, voters of Fresno, Calif., turned down a $2,990,000 bond issue for the purchase of the local distribution facilities of the San Joaquin Light & Power Corporation in a special election February 25. A total of 18,610 voters (73.9 per cent) of the city's 25,200 registered electors went to the polls, casting 12,584 votes against the bonds to 6,026 in favor. In only three of the 83 precincts did the bonds receive the necessary two-thirds majority.

The bonds were soundly defeated in the face of a vituperative and hysterical campaign waged in their favor by the Fresno *Bee* and its radio station KMJ. The San Joaquin utility conducted a vigorous and open campaign, using employees, billboards, newspaper advertising and radio.

Culminating a long-drawn-out battle waged by municipal ownership advocates for acquisition of the Tulare distribution system of the Southern California Edison Company, Ltd., an election on February 25 decided the issue in favor of the utility. Two proposals on the ballot pertaining to municipal ownership were defeated in the election. The first, providing for an issue of $400,000 of revenue bonds to purchase the Edison distribution facilities, was defeated by a vote of 866 to 737. The second, authorizing condemnation proceedings, was defeated 854 to 740. Monte Williams, "municipal ownership" Mayor of the city, resigned when the outcome of the election was made known.

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Set New Hearing On Niagara Falls Power

Rehearing scheduled for March 17 on the pending application of the Niagara Falls Power Company for amendment of the license to include diversion and use of 275 cubic-feet-per-second of water has been postponed until May 11, it was announced by the Federal Power Commission.

The scope of the hearing has been enlarged to include plans of the utility in connection with the use of the 19,725 c.f.s. already under license, power development of the river, bearing on the utility's stock ownership, intercorporate relationships and affiliations, and other matters to enable the commission to pass on the application.

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Pacific Lighting Suits End

Pacific Lighting Corporation has notified the New York Stock Exchange that all controversies, claims and suits embodied in the franchise litigation heretofore brought by the City of Los Angeles against the following subsidiaries of Pacific Lighting Corporation have been settled: Los Angeles Gas & Electric Corporation, Southern California Gas Company, Southern Counties Gas Company of California.

Units of Cities Service to Spend $42,000,000 on Expansion Plans

Capital outlay of $24,000,000 for petroleum subsidiaries and $18.-000,000 for public utilities — Installation of generating equipment to be made in Toledo, St. Joseph, Denver — Rural lines to be extended

Expenditures of $42,000,000 for new construction and improvements will be made this year by Cities Service Company, as against $29,600,000 last year, $18,200,000 in 1935, $14,500,-000 in 1934 and $7,500,000 in 1933. The capital outlay for the year will be divided $24,000,000 for the petroleum subsidiaries and $18,000,000 for public utility units.

Cities Service will spend $11,000,-000 for construction and improvements of subsidiaries engaged in the electric light and power industry in extending rural electric lines, increasing generating facilities and in routine urban extensions and replacements.

Generating units

Outstanding among the new installations for the electric units will be 31,000 kw. in Denver by the Public Service Company of Colorado, 10,000 kw. in St. Joseph, Mo., by the St. Joseph Railway, Light, Heat & Power Company, and 25,000 kw. in Toledo by the Toledo Edison Company.

Additional generating units also are being installed in Cheyenne, Sheridan and Rawlins, Wyo., and in Tucson, Ariz. Supplementing the construction of new generating capacity, interchange and purchase agreements have been signed with the American Gas & Electric Company for Cities Service subsidiaries in Tennessee and Ohio. An interconnecting tie line with American Gas & Electric will be built at Pemberville, Ohio. Another interchange and purchase contract was made with the Toledo Furnace Company for approximately 110,000,000 additional kilowatt-hours for Toledo.

Of the $24,000,000 appropriated for the oil division, $16,000,000 will be expended for the production, pipe line and storage facilities, principally in drilling offset and test wells, in new development work, in rentals and purchasing leases. Expenditures of $8,-000,000 will be made in the construction of new gasolene plants, improvements in refineries, in service station expansion and in acquisition of new retail outlets.

Allotments of $7,000,000 will be made to the natural gas subsidiaries for improvements and expansion. These expenditures for the companies, which form one of the largest natural gas groups in the world, will be in purchasing additional leases, drilling offsets and test wells and in pipe line construction and the development of underground storage facilities.

During the past year the gas subsidiaries added more than 300 miles of pipe line to their transportation systems. This included a project of 131 miles of 8- and 10-in. pipe connecting the Harrison Pool in northern Pennsylvania with the Dunkirk and Batavia distribution systems in New York. Arrangements were completed to purchase 82 miles of 10-in. pipe line extending from the Richland-Monroe, La., gas fields to El Dorado, Ark. Compressing station capacity on lines of subsidiaries was increased at Hutchinson, Kan., and a new compressing station built at Wellington, Kan.

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Power Commission Asked to Act on Rate

Charging that a contract for the sale of power by the Philadelphia Electric Company to the Delaware Power & Light Company was not made "at arms length" and that the price paid is less than the cost of generation, H. Jerome Jaspan, a resident of Philadelphia and a member of the Pennsylvania State Senate, last week filed a complaint with the Federal Power Commission asking that the present rate be suspended and a reasonable rate determined in accordance with Section 206 (a) of the Federal Power Act.

This is the first complaint of this nature to be brought before the commission under the authority granted it last year to regulate interstate power transmission.

The petition charges that both companies concerned are owned and controlled by the United Gas Improvement Company, a holding company; that the long-term contract under which the interstate power sale is made bears a rate lower than the actual cost of production, thereby raising the presumption that it was negotiated at less than arms length; that for the year ending December 31, 1936, Philadelphia Electric sold the Delaware company 172,131,384 kw.-hr. at an average rate of 4.9 mills, whereas the cost of production approximates 1.5 cents; that the rate charged is unduly preferential and imposes an excessive and unjust burden upon customers of the Philadelphia Electric Company.

•

Commission Defers Associated Hearing

Federal Power Commission has announced the indefinite postponement of its joint hearing with the Pennsylvania Public Service Commission scheduled for March 3, 1937, "to ascertain and determine all facts, conditions, practices and matters regarding the ownership, operation, management and control" of the numerous servicing companies in the Associated Gas & Electric System.

The order of postponement followed consideration by the commission of a petition filed by the Metropolitan Edison Company, Northern Pennsylvania Power Company, Pennsylvania Electric Company, Erie Lighting Company, the Clarion River Power Company and the Solar Electric Company and an application for postponement filed by Gov. George H. Earle of Pennsylvania.

•

Ask Court to Halt Sale of T.V.A. Power

The United States fifth circuit Court of Appeals last week took under advisement the application of the Georgia Power Company for an injunction against the embattled Tennessee Valley Authority to prevent sale of electric power by the federal agency to a county co-operative.

In concluding arguments, James L. Fly, T.V.A. counsel, charged the power company with "jumping from one court to another in shopping around to select the one it likes best" to get an injunction.

Judges Rufus E. Foster, Joseph E. Hutchinson, Jr., and Edwin R. Holmes heard arguments in the case.

The Tennessee injunction restrains

T.V.A. "and others" from engaging in new power line construction or from entering into new contracts to supply electrical energy in Georgia and prevents T.V.A. and the Catoosa County Farmers' Co-operative, Inc., from constructing lines crossing or "poaching" on the rights-of-way of the power company.

Georgia Power charged that T.V.A. has not qualified and is not entitled to do business in Georgia as a public utility and has not applied or received permission from the Public Service Commission for such authority.

T.V.A., the utility charged, is falsely and fraudulently "making representations" to customers of the companies and, with "other allies and confederates, is engaged without lawful warrant in building an electric line in Catoosa County."

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Failure to Register Termed Sit-down Strike By Landis

The refusal of 75 per cent of the electric utility industry to register under the Public Utility Holding Company Act was characterized as a "sit-down strike against the federal government" by J. M. Landis, chairman Securities and Exchange Commission.

Speaking before the Boston City Club last week, Mr. Landis stated that the act will be administered in the interest of constructive simplification of corporate set-ups by the S.E.C., where utilities co-operate with the government, and not as a guillotine.

Investigation of Public Utility Activities Sought in Resolution

Proposal of Rankin and Norris would seek extent to which the industry controls or influences public opinion on municipal power operations — Gadsden says opportunity to air real issues welcomed

Charging that the utilities are seeking "to defeat the efforts of the people of every municipality who attempt to acquire or construct their own electric generating or distribution system," Representative John E. Rankin of Mississippi introduced last week a resolution calling upon the Federal Trade Commission to investigate public utility activities in controlling or influencing public opinion on the municipal power issue. Senator George W. Norris of Nebraska introduced in the Senate a companion measure.

Opinion was expressed in some quarters that the investigation sought promises to be another move to harass the utility industry. It was pointed out that proponents of government ownership are attempting to scissors the barrage against the industry as the test of the constitutionality of the federal power projects progress through the courts and to divert public attention from the real issues.

Gadsden replies

The comments by the two outspoken advocates of government ownership of the utilities brought an immediate reply from Philip H. Gadsden, chairman of the Committee of Public Utility Executives, that the utility industry welcomed the opportunity to put the real issues involved in municipal ownership before the people.

It was pointed out by Mr. Gadsden that the resolutions provided "no authorization for investigation of pressure group politics for public ownership, covert inclusion of public ownership propaganda in the curricula of public schools, and other methods of public opinion control."

Charges by Rankin

Introducing his resolution, Representative Rankin charged the utilities with "conducting a campaign of false propaganda in the city of San Francisco in an effort to defeat a movement for the acquisition or construction of a municipal distribution system which would enable them to use power generated at the Hetch Hetchy project in the Yosemite National Park." Similar charges were made concerning the municipal ownership movements in Fresno, Calif.; Springfield, Ill.; Memphis, Tenn.; Jackson, Miss., and "other places which are too numerous to mention."

Expenses of the inquiry could run to $150,000 under the resolution. Among other things the Federal Trade Commission would be aided by the Federal Communications Commission, the agency which figured prominently in the "telegram seizure" during the Black committee investigation; the Federal Power Commission and other government agencies.

The commission would be called on to recommend legislation and give Congress the benefit of the study of the extent of the growth of public ownership since 1920. The activities of public utilities since 1933 would come under the scrutiny of the commission.

SAFETY RECORD—The safety committee of the Mica Insulator Company, responsible for the 100 per cent record of no-lost-time accidents during 1936, receiving the award of the Associated Industries of New York State. The company has completed seven consecutive such years. Seated (l. to r.)—F. D. Jutras, J. M. Coffey, Milton Schwenker, Manual Nodar and Earl Hutchinson. Standing—Isaac Pollock and Clarence Smith

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Utility to Spend $408,000

Southern Colorado Power Company will spend $408,000 during 1937 for new construction, an increase of $248,000 over 1936.

Passage of Withrow Power Bill Unlikely

Introduced by Representative Gardner R. Withrow, Wisconsin, to establish a Mississippi Valley Authority along the lines of the Tennessee Valley Authority, the bill is one of the many flood and power measures President Roosevelt mentioned at a recent press conference when he stressed the need for careful planning and the establishment of eight or ten regions covering the entire country.

Representative Withrow frankly doubts the probability of getting his proposed bill through Congress this year. He hopes, however, to obtain a hearing for it and passage of the measure next year when the nine dams now operating or under construction on the upper Mississippi have been completed. The chief purpose of his proposed bill, he says, is to "gather up the loose ends and harmonize and systematize the power plants on the upper Mississippi. Flood control, he admitted, plays a secondary role in his proposal. It is designed to develop hydro-electric power sources throughout the reaches of the upper river, as well as to develop industrial and agricultural use of current.

The board of three members which the bill would create would have power to construct dams, reservoirs, power houses, power structures, transmission lines and to unite the various power installations into one or more systems of transmission lines.

Other powers would include the right to produce, transmit, distribute and sell electrical power, operate laboratories and experimental plants and conduct experiments for distribution of electricity to farm organizations, municipal corporations and other purchasers and consumers.

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Utility Plans New Hydro Station on Saco River

New England Public Service Company will build a 9,500-kva., single-unit hydro-electric station on the Saco River in Saco, Me., for the Cumberland County Power & Light Company to meet load requirements of next fall. The construction work will be done by Ephraim E. Sanders, Inc., of Portland and will include a new gravity type concrete dam with integral power house capable of accommodating one machine. The operating head will be about 44 feet.

The General Electric Company will furnish the generator, a three-phase, 11-kv. machine of the vertical type, to be driven by an S. Morgan Smith Kaplan type waterwheel. The plant will be designed for automatic operation and will be tied into the system at this important load center, possibly through a new substation.

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Sound Basis a Need in Recovery Program

Major goals of governmental agencies in a program of social progress can be achieved only through engineering, by engineers, according to Dr. Karl T. Compton, president of the Massachusetts Institute of Technology. In an address at Johns Hopkins University Dr. Compton said that any lasting benefits of a recovery program must have a sound basis in useful and scientifically organized economic development.

During the celebration of the 25th anniversary of the School of Engineering the honorary degree of doctor of engineering was conferred upon John Edwin Greiner, Baltimore engineer; Carl Clapp Thomas, vice-president of Dwight P. Robinson Company; Herbert Appleton Wagner, president of Consolidated Gas, Electric Light & Power Company of Baltimore, and Abel Wolman, chief engineer of Maryland State Department of Health and chairman of the Water Resources Committee of the National Resources Committee.

F. T. Griffith Hits Power Resolution

Calling for "sanity in the Legislature of Oregon," Franklin T. Griffith, president of the Portland Electric Power Company, at the recent luncheon of the Electric Club, honoring L. T. Merwin, president of the Northwestern Electric Company, branded the Bonneville power resolution adopted by the house as an effort to commit Oregon to a "policy of destruction."

He warned the 200 electrical executives at the meeting not to "fall for the doctrine that governmental regulation of private industry has failed, and consequently governmental operation should be attempted." He contended that the resolution would place the federal government, with its almost unlimited spending power, into direct competition with private power enterprise with no regard for private interests and investments.

"We are co-operating with the Portland Chamber of Commerce in seeking new industries to use power to be generated at Bonneville, but the additional power left should be distributed through existing private facilities, with savings passed on to the consumer," Mr. Griffith said.

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New Substation Planned

Arrangements have been completed for the erection of a substation of the outdoor type just east of Mt. Vernon by the Southern Indiana Gas & Electric Company, according to L. R. Agin, local manager.

PLAN PRODUCTION—Sales and engineering forces of the James R. Kearney Corporation at a recent meeting in St. Louis to co-ordinate plans for greater production along with introduction of new equipment

Vote Sought to End Cities Service Suit

Stockholders of the Cities Service Company at a special meeting in Dover, Del., on March 16 will vote on a proposal to approve the offer of compromise and settlement of the suit brought by six holders owning 840 shares of stock against Henry L. Doherty, Cities Service and affiliated companies and ten of Mr. Doherty's fellow directors.

The settlement proposed was contained in a letter from Henry L. Doherty to Joseph M. Proskauer, his counsel, and was conditioned upon the approval of stockholders and of the court (ELECTRICAL WORLD, February 6, page 8). Mr. Doherty offered to pay $1,250,000 in cash or common stock of Cities Service Company in order to avoid the interference with conducting the business entailed in fighting the suit.

Among other actions upon which stockholders will vote on March 16 are the retirement of 1,000,000 shares of $1-par 5 per cent non-cumulative stock of the company and the discontinuance, heretofore carried out, of the fiscal agency and management relationship between Henry L. Doherty & Company and the Cities Service Company and its subsidiaries.

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Milwaukee Utility Plans Expansion of Facilities

Announcement has been made by G. W. Van Derzee, vice-president and general manager, that the Milwaukee Electric Railway & Light Company will spend approximately $3,565,000 in 1937 for replacement of equipment and expansion of facilities.

The largest project is a new boiler for the E. Wells Street heating plant, which, with an Allis-Chalmers back pressure turbo-generator, will cost approximately $1,283,000. A building to house the new boiler will be started this year and the new equipment is to be installed by the fall of 1938. Routine replacements, extensions and improvements will also be made.

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Columbia's Five-Year Plan

A five-year plan for expanding the physical facilities of the Columbia University School of Engineering, at a cost of approximately $2,500,000, was outlined by Dean Joseph W. Barker in his annual report to President Nicholas Murray Butler. "The most pressing need is for laboratory space for the electrical and mechanical engineering departments," Dean Barker said. Construction and the necessary equipment to permit this expansion in the electrical and mechanical engineering departments will involve nearly $2,500,000.

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Handbook Prepared on Interior Wiring

A handbook on "Interior Wiring Design" has been prepared by the Industry Committee on Interior Wiring Design and contains specifications, details and plans of complete wiring design, developed to meet increased electrical demands.

Prepared by the joint committee under the chairmanship of E. A. Brand, Niagara Hudson Power Corporation, Buffalo, the work is the outgrowth of preparations started in June, 1935, by the sales committee of the Edison Electric Institute. In the joint sponsorship with the E.E.I. are the Artistic Lighting Equipment Association, Illuminating Engineering Society, International Association of Electrical Inspectors, National Electrical Manufacturers Association, National Electrical Contractors Association, National Electrical Wholesalers Association and the Radio Manufacturers Association.

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Offer $130,000,000 Bonds For Utility

Public offering of $130,00,000 of Philadelphia Electric Company 3½ per cent first and refunding mortgage bonds, due March 1, 1967, was made this week by an underwriting group of 69 members headed by Morgan Stanley & Company. The bonds were priced at 102½ and accrued interest to yield 3.367 per cent to maturity.

The offering is the largest for any electric power operating company under the Securities Act of 1934, having been surpassed in recent years only by the two issues of American Telephone & Telegraph Company. Net proceeds to the company, estimated at $129,932,250, will be used with treasury funds and cash to redeem all existing bonds of the company outstanding.

Bill Asks Agencies to Control Floods

Seven new "Authorities" patterned along T.V.A. lines would make production of electricity secondary

Seven new federal "authorities" patterned along the lines of the Tennessee Valley Authority would be created by the bill introduced by Senators Barkley, Democrat, of Kentucky, and Buckley, Democrat, of Ohio.

Describing the proposal as a flood-control measure, the Senators declared that the powers of the new agencies would be similar to those of the T.V.A. and that the development of electric power would be incidental to flood control.

Territorial jurisdiction for the proposed agencies follows:

Great Lakes-Ohio Valley Authority—The area containing the rivers flowing into the Great Lakes, and the Ohio River and its tributaries, except the Tennessee River system.

Atlantic Seaboard Authority—Navigable rivers along the seaboard from Maine to Florida.

Missouri Valley Authority—Missouri River and its tributaries.

Arkansas Valley Authority—Arkansas River system and all other rivers south of the Missouri River flowing into the Mississippi River and the Gulf of Mexico.

Mississippi River Authority—The Mississippi River and its tributaries, except those within the jurisdiction of other authorities.

Colorado Valley Authority—Colorado River system and all other rivers flowing into the Pacific Ocean south of the Columbia River.

Columbia Valley Authority—Columbia River system.

These authorities would be authorized to erect, maintain and operate dams, reservoirs, canals and other works necessary to the control of the "destructive" flood waters of the rivers of the United States, to improve the navigability of such rivers, to direct reforestation and conservation of natural resources and to set aside marginal lands for timber, preserves, recreational and other purposes.

The bill also provides that any of the seven authorities might, when it deems such action desirable, recommend the development of electrical power in connection with any project under its jurisdiction for its approval.

Introduction of the bill was viewed in Washington circles as a step to set up a network of hydro-electric projects which would cover the entire area of the county. The T.V.A. was set up as a flood-control and navigation project, but has developed into a power project as its chief aim.

Westinghouse Makes Change in Wage Plan

Westinghouse Electric & Manufacturing Company has revised its wage and salary adjustment plan under which adjustments will be made each month in line with the company's earnings to take into consideration the total payroll in addition to earnings. Under the new plan when the base payroll for the three months is over $5,000,000, "then the amount of the average net income over $600,000 which will result in a 1 per cent increase of the base wage or salary for the next month is that figure which bears the same relation to $60,000 which the average base payroll for the preceding three months bears to $5,000,000."

Under the original plan the pay of each employee for the month immediately succeeding a three-month period was arrived at by adding to the normal base rate 1 per cent for each $60,000 unit by which the three-month averaged earnings exceeded $600,000.

Demands had been made for a 20 per cent wage increase for more than 8,000 employees of the company's Pittsburgh plants and a threat of a strike unless the demands were met.

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Introduce Safe Wiring Bill in Texas Legislature

A bill has been introduced in the Texas Legislature (H400) that would require natural gas, water, electric and telephone companies before connecting service for a customer to inspect and approve as being safe all wires, pipes, fixtures and conductors exclusive of the actual appliance in which the utilities are used. Regular reinspections, not less than one year apart, are called for.

The utilities are not permitted under the bill to permit service if the wiring is unsafe upon initial inspection; if found unsafe on reinspection, owners are to be notified to make correction.

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Appliance Sales Increase

Sales of electric refrigerators during 1936 in Southern California Edison Company territory increased 15,886 over 1935, according to the year's report issued by the company. Total refrigerator sales made by electrical dealers in Edison service territory were 51,409. Dealers sold 6,575 electric ranges, a gain of 930 over the previous year. Increases also were registered in water heater sales, as in sales of smaller home appliances. The Edison company merchandising activities are promotional on behalf of the dealers, since the company does not sell directly.

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To Build 50-Mile Mine Line

Preliminary surveys have been started by the Washington Water Power Company for a 50-mile, 110,000-volt transmission line from the Chelan power station to the copper mine of the Howe Sound Mining Company near Lucerne, Wash. The Howe Sound company plans immediate construction of a new mill of 1,000 tons daily capacity, largest in the state of Washington, at the site of the Holden mine, which experts declare is one of the biggest copper properties in America.

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Tuscumbia Plans Completed

Arrangements have been completed for the city of Tuscumbia, Ala., to begin the use of T.V.A. power on April 1, at a reduction of from 25 to 40 per cent under present rates and at an estimated profit of $20,000 a year. With the proceeds of a recent bond issue the city has purchased the local distribution system of the Alabama Power Company for $106,500 and will buy main-line T.V.A. power at 4 mills per kilowatt. The new consumer rates are fixed by the T.V.A.

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R.E.A. Sets 1-Cent Rate as Reasonable for Energy

A wholesale rate of 1 cent a kilowatt-hour or thereabouts has been suggested by the Rural Electrification Administration as a reasonable rate for a rural electrification co-operative to pay for energy.

In the March issue of the magazine published by R.E.A. it is stated that "since the difference of a fraction of a cent per kilowatt-hour in the wholesale rate of electricity will sometimes make the difference between a sound and an unsound project, every effort should be made to buy energy for 1 cent per kilowatt-hour or thereabouts."

Clash Over Curb on City Power Profits

Strong opposition has developed to a bill proposed in the New York State Legislature which would prohibit municipally owned utility plants from operating at a profit. At a Senate committee hearing this week the proposal, intended to carry out a recommendation of Gov. Herbert H. Lehman, was vigorously opposed by Mayor Ansel B. Young of Greenport, president of the Municipal Electric Utilities Association of the state, and Paul Shipman Andrews, counsel. Their main objection was that such a law would remove the incentive for municipally owned plants, which they said was tax reduction.

"I don't know who had the authority to say the purpose of municipal plants is to operate at the lowest cost to the consumer and rob the taxpayer," Mr. Andrews said.

Speakers opposing the bill said that the elimination of the profit making would result in greatly increased taxes.

Milo R. Maltbie, chairman; Maurice C. Burritt and Neal Brewster, members of the Public Service Commission, favored the measure.

It was contended by Mr. Maltbie that many municipal plants had built up unreasonably large surpluses. He accused the municipalities of "joining the companies now making regulation as difficult as possible."

"I insist that there is no fairness in making the public pay for the plant and then also making them pay 6 per cent on the investment." It was Mr. Maltbie's contention that municipalities which objected to the bill should present some standard of what a municipal rate ought to be.

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Kansas Gas Rehearing Set

The Federal Power Commission has granted a rehearing to be held on April 7 on the application of the Kansas Gas & Electric Company for approval of maintenance of permanent connections for emergency use only. The company's original application was dismissed by commission order of December 31, 1936. The company sought authority to establish permanent connections for emergency use with the Oklahoma Gas & Electric Company and with the Empire District Electric Company.

McNinch Rate Stand Assailed by Maltbie

Milo R. Maltbie, chairman of the Public Service Commission, has concluded that Frank R. McNinch, chairman of the Federal Power Commission, has no "legal proof" that electric rates in New York compare unfavorably with those elsewhere. The letter sent last week to Mr. McNinch was in reply to one from the federal official during the controversy over remarks made by Mr. McNinch before a congressional committee.

Mr. Maltbie stated that "the commission overlooks the acrimonious tone of your last communication. The issue is simple and it is now apparent, and particularly from your failure to comply with our request to fix early dates when you would be prepared to submit proof, that you do not now have any legal proof to submit to this commission.

"We will give you a public hearing whenever you have legal proof that any public service corporation under our jurisdiction is failing to perform its duty as to reasonable rates, adequate service or any other statutory or administrative requirement.

It was pointed out by Mr. Maltbie that the commission has been and is proceeding with its investigations of New York City utilities and the results will be made public in due course.

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Seeks to Extend Option

At the instance of Mayor Carson the Portland (Ore.) City Council has directed that action be taken to extend the city's option to buy the Northwestern Electric Company after November 13, when the present option expires. City Attorney Grant will outline procedure for the Council to follow to get probably two years more in which the city may mull over the question. The Mayor stated Council should not let the option expire until the people have determined whether they want to take over the property. He pointed out the people turned down a proposal to spend $50,000 for a survey as a step toward acquisition of the property, but he could not determine whether that was a vote against the money or one against the project.

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Power Sales Show Gain

Expenditures of $604,000 are to be made this year by United Electric Light Company of Springfield, Mass., on construction, mostly on improvements already started. Kilowatt-hour sales showed an increase of 9,273,680. The March flood loss was estimated at $409,300.

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Emerson Electric Plant Strike Called by Union

Members of the United Electrical and Radio Workers of America, an affiliate of the Committee for Industrial Organization, went on strike this week at the Emerson Electric Manufacturing Company.

The union, which had announced its intention of organizing employees of more than twenty electrical manufacturing concerns in St. Louis, demanded recognition as sole bargaining agent for the Emerson workers, increased wages and elimination of piece work.

Bond & Share Stay Is Made Permanent

Electric Bond & Share Company and twelve subsidiaries and affiliates have been permanently enjoined from violating provisions of the public utility holding company act in a decree handed down this week by Federal Judge Julian W. Mack. The action was in line with the opinion handed down by Judge Mack last January. The injunction will become operative "thirty days after the date of the decree," which was signed last Saturday.

The degree was granted by Judge Mack without "prejudice to the rights and remedies at law or in equity which the defendants may have after registering as holding companies." The decree also provides that if the defendants take an appeal and perfect it within legal time limits, the injunction shall be stayed "as to appealing defendants," without further bond or supersedeas order, pending decision by the Circuit Court of Appeals or the Supreme Court.

The utilities are considering the different possibilities open to them, but as yet no decision has been made as to appealing or registering under the act.

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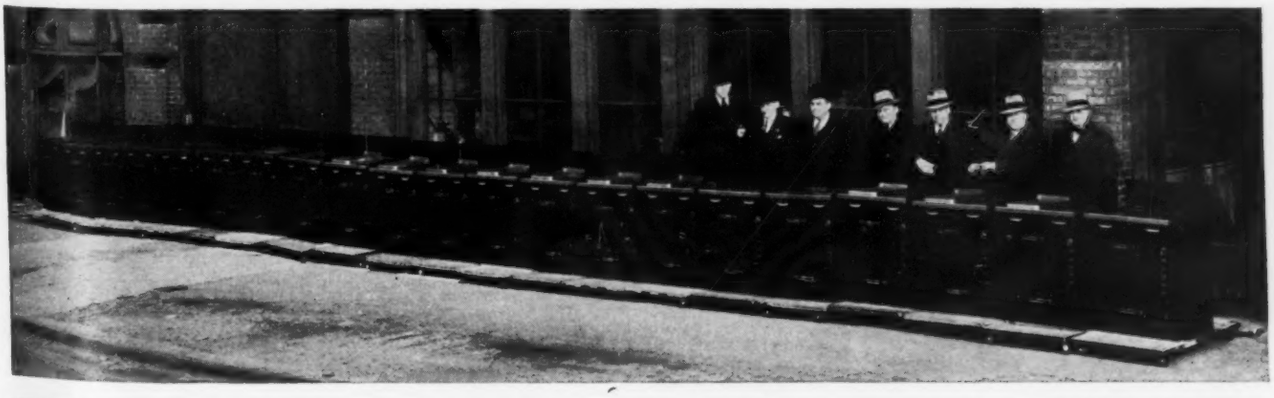
Stockholders Cancel Stock

Stockholders of the United Corporation at their annual meeting last week in Wilmington, Del., canceled the power of directors to issue 1,000,000 shares of first preferred stock which had been authorized in 1927. The cancellation was recommended by the board.



HEAVY DUTY—Part of a quantity shipment to Buffalo, Niagara & Eastern Power Corporation of a recently developed commercial range of Standard Electric Stove Company for use in small restaurants, wayside stands, etc. (l. to r.) T. I. Messenger of Buffalo, Niagara & Eastern Power; Charles A. Pierson, president, and H. H. Venable, sales manager, Standard Electric Stove; Donald Faller and Harry Hall, Toledo Edison Company, William P. Swarts, Pacific Coast district sales manager, and F. W. Cuthbert, purchasing agent, Standard Electric Stove

Santee-Cooper Issue Raised at Hearing

Hearings started this week in the U. S. District Court at Columbia, S. C., on the suit of the Carolina Power & Light Company, South Carolina Power Company and Broad River Power Company to block P.W.A. financing for the Santee-Cooper hydroelectric project of the South Carolina Public Service Authority. As in some fifty other cases now pending, the issue raised is whether the federal government has authority to give financial aid to local authorities in developing publicly owned power.

Two days earlier the Federal Power Commission extended to December 31, 1941, the time limit for completing construction on the initial phase of the project. The extension was based on a finding that actual construction had been begun, but that the work had been delayed because of litigation and other factors beyond the control of the licensee. The license is held by the Columbia Railway & Navigation Company, which has contracted to turn the project over to the public agency.

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Residents of Nantucket Make Threat to Secede

Residents of the island of Nantucket have threatened to secede from Massachusetts and rejoin New York, of which the island was a part in Colonial days, unless Massachusetts officials bring lower electricity rates, State Representative William T. Swain of Nantucket declared recently. Mr. Swain told the State Public Utilities Commission some residents wanted to vote at the town meeting on seceding. His statement was made as the commission opened a hearing on a petition of customers of the Nantucket Gas & Electric Company for electric rate reductions. A representative of the company contended the island's location 30 miles off Cape Cod and the influx of summer residents increased the cost of production.

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Rural Service in Alabama

Alabama Polytechnic Institute at Auburn has entered into agreements with both the Alabama Power Company and the T.V.A. "to assist Alabama farmers, farm women, rural residents and small rural industries in making intelligent, full and profitable use of electric service," Dr. L. N. Duncan, president, recently announced. The work will be carried out under the supervision of J. B. Wilson, specialist in agricultural engineering of the Alabama Extension Service.

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Harvey Couch in Rail Deal

Harvey C. Couch, president of the Arkansas Power & Light Company, has been elected a director and chairman of the executive committee of the Kansas City Southern Railway. Through a recent deal Mr. Couch, formerly director of the Reconstruction Finance Corporation, acquired a substantial interest in Kansas City Southern.

Meetings

National Oil Burner and Air Conditioning Exposition—Philadelphia, Pa., March 15-19, C. F. Curtin, exposition manager, Oil Burner Institute, 30 Rockefeller Plaza, New York, N. Y.

Oklahoma Utilities Association—Annual Convention, Mayo Hotel, Tulsa, Okla., March 22-23. Kate A. Niblack, acting secretary, 625-626 Biltmore Hotel, Oklahoma City, Okla.

Northwest Electric Light & Power Association—Business Development Section, Salt Lake City, Utah, March 25-27. George H. Wisting, section chairman, Northwestern Electric Company, Portland, Ore.

Edison Electric Institute—Annual sales conference and sales committees meetings, Edgewater Beach Hotel, Chicago, Ill., March 29-April 2; technical committees, Chicago, May 3-7; annual meeting, Chicago, June 1-4. Bernard F. Weadock, managing director, 420 Lexington Avenue, New York, N. Y.

Greater New York Safety Council—Annual convention, Astor Hotel, New York, N. Y., April 13-15. Paul W. Garrett, secretary, 60 East 42d St., New York, N. Y.

International Association for Testing Materials—International congress, London, England, April 19-24. K. Headlam-Morley, honorary secretary, 28 Victoria St., London, S.W.1.

Missouri Association of Public Utilities—Annual convention, Elms Hotel, Excelsior Springs, Mo., April 21-23. Jesse Blythe, assistant secretary, 101 West High St., Jefferson City, Mo.

Electrochemical Society—Spring meeting, Benjamin Franklin Hotel, Philadelphia, Pa., April 28-May 1. Colin G. Fink, secretary, Columbia University, New York, N. Y.

National Electrical Manufacturers Association—Spring meeting, The Homestead, Hot Springs, Va., May 16-20. W. J. Donald, managing director, 155 East 44th Street, New York, N. Y.

Southeastern Electric Exchange—Fourth annual conference, The Homestead, Hot Springs, Va., May 27-29. J. W. Talley, executive secretary, 308 Haas-Howell Building, Atlanta, Ga.

P.R.R. Contracts Total $50,000,000

Pennsylvania Railroad Company, Philadelphia, Pa., has awarded contracts for construction work on electrification of line between Paoli, near Philadelphia, present terminus of electrified lines, to Harrisburg, Pa., a total distance of about 315 miles of line and 773 miles of track.

The award is divided between four companies at Philadelphia and one at Baltimore, Md., as follows: McCloskey & Company, Vare Construction Company, James McGraw Company and Louchheim, Brown & McDonough, all of Philadelphia, and the Arundel Corporation, Baltimore. Contracts include actual construction phases of project, the equipment and materials to be purchased by the railroad.

The work has been divided into five sections, each contracting company to handle one section. Project will include steel towers for catenary construction, feeder lines, transmission lines for connection with power substations to be located at points along the route, equipment for power substations and miscellaneous construction, and is estimated to cost $50,000,000. The completion will give the Pennsylvania Railroad about 41 per cent of the total electrified railway trackage in the country. Company has arranged a bond issue totaling $52,670,700, to provide funds for project, which is scheduled to begin in March.

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General Markham Proposes Army Operate Bonneville

Major-General Edward M. Markham, Army chief of engineers, has proposed an amendment to the Bonneville bill providing that the army operate the power plant after completion so as to produce the amount of power demanded by the market, as determined by the proposed Columbia River Administrator. This would leave all phases of dam operation with the Army, limiting the jurisdiction of the administrator to power beyond the busbar.

General Markham said that the change had been fully agreed to by President Roosevelt. The amendment was accepted by Representative Smith, who introduced the bill embodying the recommendations of the Ickes committee.

Output Goes 15.6 per Cent Over 1936

Energy production by the electric light and power industry continues to hold up to the level of four weeks ago, contrary to the usual downward trend at this season. During the week ended March 6 it amounted to 2,199,976,000 kw.-hr. and the lead over the like period of 1936 jumped to 15.6 per cent, according to the Edison Electric Institute. The percentage was virtually up to that of the week of January 23 and larger than in any other week since last October.

Some of the regional comparisons with operations a year ago have a significance that is not confined to the power industry. In the Central industrial region, noted for its automobile, steel and related industries, the increase has risen to 21 per cent. In the mountain states, where much energy is used for the production of copper, it climbed to 23.5 per cent. New England section continued above 14 per cent.

Weekly Output, Millions of Kw.-Hr.

1937	1936	1935
Mar. 6...2,200	Feb. 29..1,903	Mar. 2..1,734
Feb. 27...2,207	Feb. 22..1,942	Feb. 23..1,728
Feb. 20...2,212	Feb. 15..1,950	Feb. 16..1,761
Feb. 13...2,200	Feb. 8..1,952	Feb. 9..1,764
Feb. 6...2,201	Feb. 1..1,963	Feb. 2..1,763
Jan. 30...2,215	Jan. 25..1,956	Jan. 26..1,782

Per Cent Change from Previous Year

Region	Week ended Mar. 6	Feb. 27	Feb. 20
New England.....	+14.2	+14.4	+15.4
Middle Atlantic....	+12.3	+10.6	+11.8
Central Industrial.	+21.0	+19.2	+17.6
West Central.....	+ 9.5	+ 7.1	+ 5.4
Southern States...	+17.7	+16.8	+12.8
Rocky Mountain..	+23.5	+18.5	+10.9
Pacific.....	+ 7.2	+ 6.1	+10.5
United States...	+15.6	+13.7	+13.4

January Output Up 11 per Cent

With an output of 10,236,854,000 kw.-hr. in January, as reported by the Federal Power Commission, public utility operations rose to a new record for the month, 11 per cent above the corresponding figure in 1936. The output was exceeded in only one other month, December, 1936, when it amounted to 10,522,652,000 kw.-hr., according to revised figures.

The report shows that the increase over a year ago was somewhat smaller than in other recent months and that it fell short of the average for the year 1936, which was 14 per cent.

Production of energy from water power rose to nearly 4,000,000,000 kw.-hr. against 3,362,000,000 in November and 3,651,000,000 in December, and it constituted 39 per cent of the total.

Rising operations at Boulder Dam are revealed in striking figures for Nevada, where the output heretofore has been small and where the year's increment shows the fantastic rate of 2,478 per cent, while California, due to the influx of this energy, reports a decrease of 9 per cent. Nevada's production from water power ran up to 82,159,000 kw.-hr. against 49,412,000 in November and 69,672,000 in December.

Regional quantities for January and changes in December and January compared with a year ago are shown in the table.

Energy Output, Public Utility Plants, January, 1937

Region	Output, January (Millions of Kw.-Hr.) Hydro	Fuel	Total	Increase over year (Per Cent) Jan.	Dec.
United States...	3,997	6,240	10,237	+11	+15
New England...	363	318	681	+ 6	+14
Mid. Atlantic...	888	1,850	2,738	+11	+13
E. No. Central.	188	2,189	2,377	+ 9	+17
W. No. Central.	165	491	656	+18	+ 9
South Atlantic..	863	432	1,295	+12	+22
E. So. Central..	367	81	449	+13	+24
W. So. Central..	46	436	481	+16	+14
Mountain.....	271	119	390	+31	+38
Pacific.....	846	324	1,170	+ 2	+ 5

Utility Stock Prices Move Higher

Utility stock prices rose sharply this week from the year's lows of a week ago. The general market was buoyant, with exceptional strength in heavy industries. "Electrical World" index, 38.2; last week, 36.8; mid-January, 41.5

Illinois Utility Files Capital Change Plan

Illinois Power & Light Corporation has filed a plan of recapitalization with the Illinois Commerce Commission and has made application to the Securities and Exchange Commission for a report on the plan under the Public Utility Act. The plan will be submitted to stockholders as soon as all governmental approvals are obtained.

The plan calls for the issuance of one new share of 5 per cent $50-par convertible preferred stock for each share of present $6 and 6 per cent $100-par issues. The new preferred stock would be redeemable at $52.50 a share and would be convertible into two shares of new no-par common stock at $25 stated value.

The old preferred, in addition, will receive one share of new common stock and a dividend arrears certificate. Arrears will amount to $24 a share May 1, convertible into one share of new common stock.

Each two shares of present no-par common stock would be reclassified into one share of new common and one warrant to purchase, between May 1, 1938, and May 1, 1948, one share of new common stock for $30. Should the plan be effected 76 per cent of stock-voting power would be given to present preferred-stock holders.

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Utilities Power & Light

Committee for the protection of holders of gold debentures of Utilities Power & Light Corporation has filed a registration with the S.E.C. covering certificates of deposit for $14,000,000 of 5½ per cent debentures and $36,000,000 of 5 per cent debentures. The registration states that no steps as yet have been taken to prepare a plan of readjustment or reorganization. The company has filed under Section 77-B for reorganization.

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Permission Sought to Borrow $1,500,000

The Federal Power Commission has set March 18 for a hearing on an application by the Montana-Dakota Utilities Company of Minneapolis for permission to borrow $750,000 from the Northwestern Bank and Trust Company of Minneapolis and a like amount from the First National Bank and Trust Company of Minneapolis.

The money would be used, the applicant said, to pay secured notes for $648,971 and to retire by purchase or by redemption certain outstanding securities. In addition to the approval of the Federal commission the transaction must also be approved by the Board of Railroad Commissioners of North Dakota, with which the company has filed. As no public offering is involved, the issue will be exempt from the registration requirements of the Securities Act.

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Georgia Utility Dissolved

In a report to the S.E.C. made public this week by the New York Stock Exchange the General Gas & Electric Corporation declared that, in consideration of cancellation of its stock and of its indebtedness, its subsidiary, the Folkston Power Company, had transferred its assets to the Georgia Power & Light Company and had dissolved.

New Issues of Electric Light and Power Securities in February

Name of Company	Amount (Par Value)	Offered to	Period	Class	Purpose	Interest Rate	Price	Per Cent Yield
Atlantic City Electric Co.	$18,000,000	Public	27	General mortgage bonds	Refunding	3¼	101%	3.19
Dallas Power & Light Co.	16,000,000	Public	30	First mortgage bonds	Refunding and general corporate purposes	3½	102¾	3.35
Dayton Power & Light Co.	1,500,000	Placed privately	25	First and refunding mortgage bonds	Refunding and construction	3¼	.....	.....
Mountain Utilities Corp.	125,000	Public	20	First mortgage bonds	Refunding, acquire property, additions	5	100	5
Northern States Power Co. (Minn.).	75,000,000 28,325,000	Public Public	30 ..	First and refunding mortgage. Cumulative preferred stock	Refunding Refunding	3½ 5	101% $103	3.44 4.85
Rochester Gas & Electric Corp.	3,000,000	Placed privately	29	General mortgage bonds, series G	Additions and betterments	3¾	104	3.53
Total	$141,950,000	.....	..	.....	.....	.....	.....	.....

Oil-Filled Cable

HAS NOW PASSED ITS FIRST 1000 MILES

Still not a Single Electrical Failure

TEN years ago oil-filled cable stepped out of its swaddling clothes and into its first commercial installations. In that decade, how lusty it has grown! As old 1936 passed out of the picture, the length of oil-filled cable in service—or being installed—totaled 1048 miles. It ranged in voltage from 15,000 to 220,000 volts. Eleven countries were represented: Argentina, France, Germany, Great Britain, Holland, Italy, Japan, Manchukuo, Sweden, Switzerland, and United States of America. Yet in all these 10 years—and even with this great mileage—oil-filled cable has yet to experience its first electrical failure. That is dependability! But today oil-filled cable offers even more. Improvements in material, in design, and in methods of installation have lowered the cost — have made possible new economies. Will oil-filled cable show like savings on your next high-voltage underground circuit? General Electric Company, Schenectady, New York.

520-112

GENERAL ELECTRIC

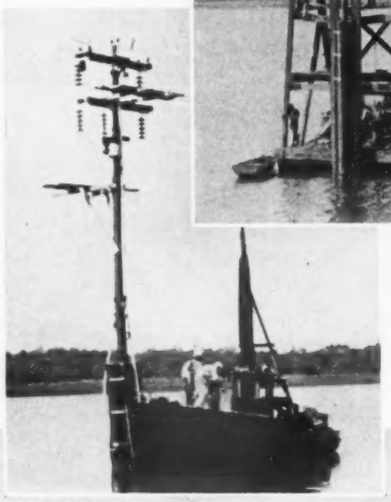
Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Georgia Power Line Gets Across River

In its recent construction of an 11-kv. distribution line from the Brunswick steam plant to Woodbine, a distance of 26 miles, the Georgia Power Company found it necessary to cross rivers, swamps, marshes and soft fields.

The pictures, from *Snap Shots*, company house organ, suggest how Turtle River was crossed. Two 11-kv. cables, 3 in. in diameter, were strung between terminal structures placed across the river from each other. Two cables are used to maintain power service, in the event one fails, and the length of span on the bed of the river is 1,000 ft. The terminal structures, or pothead poles, are approximately 85 ft. high, with some 30 ft. submerged, and carry separate potheads for connecting each cable to the bare overhead wires. They consist of one pole driven deep into the river bed, another placed on top and three more wired and bolted around their juncture.



Above—Placing cable on one of two pothead poles. At left — Placing potheads on the two cables. Below—Crew stringing 3-in., 11-kv. cable from end of barge

Power line strung across Turtle River

Dry Flooded Machines Under Difficulties

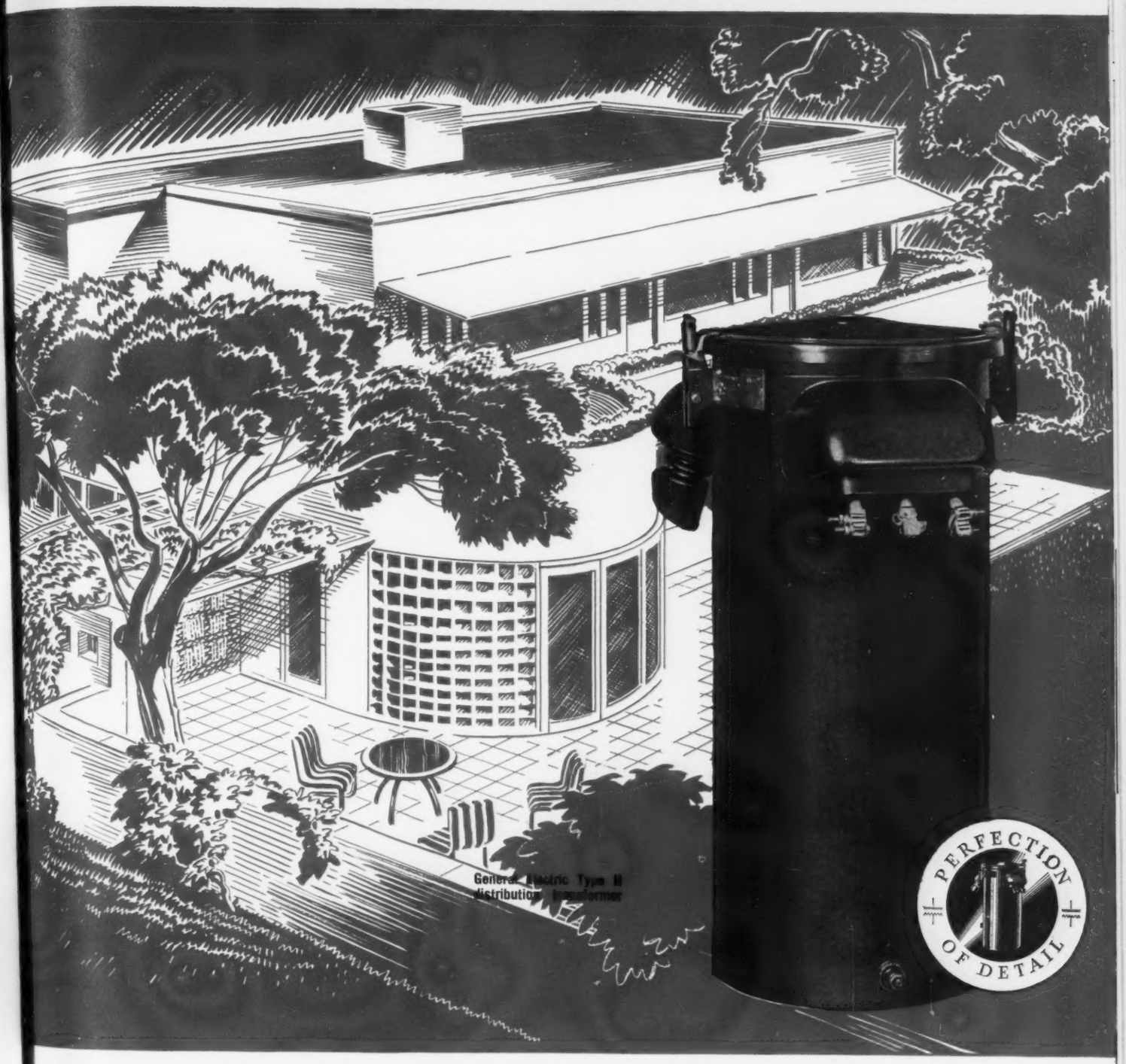
"Necessity is the mother of invention." This statement was frequently proved during the recent floods in the Ohio Valley as engineers struggled to dry out waterlogged equipment and restore electric service. The ingenious methods employed by a G.E. engineer in drying out an armature and magnet core for a 1,000-kw. rotary converter necessary for the restoration of trolley service are quoted from his field service report:

We managed to strip the rigging from one end of the rotary converter and wash it out by scooping buckets of water off the floor and throwing it into the machine—no other water supply being available. Fortunately the floodwaters here do not seem to carry as much silt as last year's floodwater did.

I had planned to remove the shunt field coils and dry them in a vacuum tank. We had already ordered new insulation for the a.c. and d.c. brush rigging. Preparations had been made to spin the armature at half speed. Also, the oven to cover the armature and magnet frame had been made out of a sort of wall board. We removed the shunt fields, ran the armature for an hour at half speed, thereby throwing out considerable oil and water; installed space heaters under the armature core, commutator and slip rings, and had the oven in place and heat turned on two days after starting work, although we lost six hours waiting for current to run the motor to spin the armature.

The commutating field coils were not disturbed and we brought out a megger wire from each coil to the outside of the oven. These field coils meggered about 2,000 ohms and the armature zero at the start of the run. Fourteen hours after heat was turned on the coils measured better than five megohms. The armature read zero on a 100-volt, 5-megohm instrument for seven-

THE IMPORTANCE OF SERVICE CONTINUITY IS GROWING



AS THE IMPORTANCE of electricity in the modern home grows, so grows the importance of service continuity. In G-E distribution transformers you will find the top reliability that the new load demands—gained through years of painstaking attention to "Perfection of Detail"—reflected in operating records that are almost unbelievably good. General Electric Company, Schenectady, New York.

300-57

GENERAL ELECTRIC

teen hours. Then I turned it a half turn and one hour later it read 30,000 ohms; three hours later it read 100,000 ohms. This indicates that spinning an armature before starting the drying run and giving it a half turn every six hours or so is beneficial; I have never had an armature come up so quickly. This one had been completely submerged for four or five days.

We then made a vacuum tank out of a piece of cast-iron pipe 36 in. in diameter and 10 ft. long, part of an old exhaust steam header in another station. The walls of this pipe were about an inch thick. Strip heaters were placed on the outside of the pipe and heavily lagged with old steam-pipe covering. Automobile spark plugs were tapped into one of the end covers and the shunt field winding and metal spool body were connected to these plugs to take megger readings, and also to take temperature readings inside the tank with a thermocouple.

The eight shunt fields were placed in this tank by themselves and after eight or ten hours all of them meggered better than five megohms. The temperature inside the tank was 130 deg. C. All fields meggered less than 2,000 ohms when placed in the tank and more than one gallon of water was drawn off in 24 hours.

•

Timber Frame Tests Anchor Holding Power

By H. A. MARTIN
Consultant, New York, N. Y.

A good way to test anchors and soil-holding power is to use a vertical framework of timber and do the pulling with the truck winch-line. All the timber shown in Fig. 1 was Douglas fir. In wet, sandy soil the following are some of the test results obtained with this mechanism:

Test 1—Anchor 834, set 7 ft. 6 in. at 45 deg., stood 14,000 lb. pull. Dynamometer was removed and anchor pulled to failure or about 20,000-24,000 lb. Anchor moved few inches, indicating packing of earth above anchor.

Test 2—12-in. cone anchor, set 7 ft. 4 in. at 45 deg., stood 13,600 lb. pull. Dynamometer was removed and anchor pulled to failure or about 20,000-24,000 lb. Anchor hole dug with shovel and spoon. At 13,600 lb. pull anchor had moved up 2 in.; total pull-up at failure 10 in.

Test 3—12-in. cone anchor, set 5 ft. 6 in. (using 6-ft. rod). Anchor hole bored with posthole borer. Anchor assembled with ⅝-in. strand clamps and pulled to 7000 lb. when clamps slipped. More careful tightening of clamps permitted pull of 10,800 lb. before slipping. Dynamometer was removed and anchor rod pulled in two at estimated tension of 20,000-24,000 lb. The amount of pull-up of this anchor at failure was 10 in.

The rods failed in each case as shown in Fig. 2, which shows obvious tension breaks, and the test indicated excellent holding power of the soil in this location.

We estimate that the structure withstood stresses caused by failure of rods of between 20,000 and 24,000 lb., depending on the tensile strength of the galvanized steel rods.

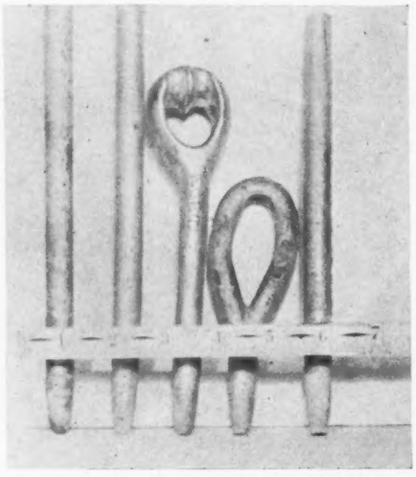


Fig. 2—Rods that failed under tension

Rod eye began to deform at about 14,000 lb. pull. Single three-bolt clamps slipped on ⅝-in. strand at about 7,000 lb.

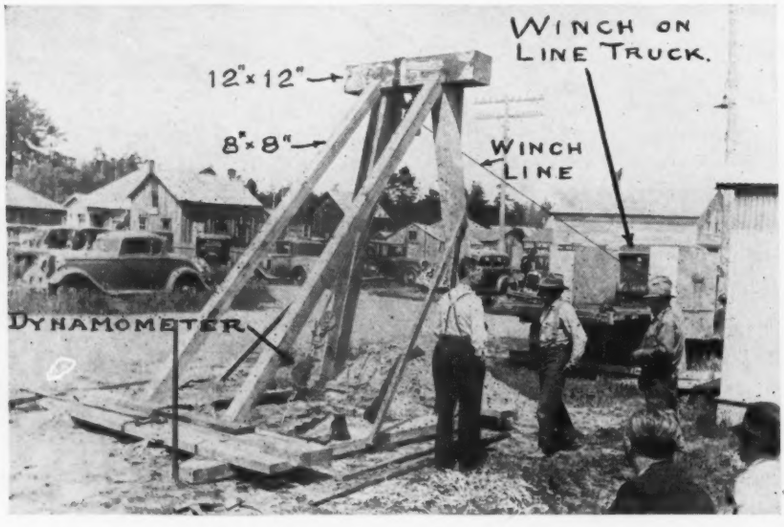


Fig. 1—Tells whether this anchor will hold in that soil

Instructions for Insulator Selection

By the Detroit Edison Company

48-Kv. Pin Insulator—For supporting 48-kv. wire.

24-Kv. Pin Insulator—For supporting 24-kv. wire.

24-Kv. Deadend Assembly—For deadending 24-kv. conductors where the loaded tension exceeds 900 lbs.*

Primary Pin Insulator—For supporting primary wires No. 0000 and smaller, street circuits, open-wire system communication circuits and 24-kv. ground wire on side-pole brackets.

Large Groove Primary Pin Insulator—For supporting open primary training wires; No. 0 and larger rubber insulated and No. 0000 weatherproof.

Primary Deadened Spool—For deadening duplex on street circuits and for deadending single-circuit system communication wires, unless conditions make crossarm construction advisable.

6-in. Disk Insulator—For deadending primaries No. 2 and larger when the loaded tension exceeds 1,000 lb. and for cutting primaries and street circuits at taps controlling more than five lamps.

Secondary Pin Insulator—For supporting secondary wires No. 0000 and smaller.

Large Groove Secondary Pin Insulator—For supporting secondary wires larger than No. 0000 and for supporting vertical secondary training wires either open or braid-covered cable, where attached directly to a pole and where not inclosed in conduit or molding.

Secondary Deadened Spool—For deadending secondaries No. 2 and larger, when the loaded tension exceeds 1,000 lb. on crossarms or 1,400 lb. on rack construction.

Ground Wire Pin Insulator—For supporting 24-kv. ground wire on 17-in. wood pin.

Medium Guy Insulator—For insulating strand having an ultimate strength less than 6,500 lb. (6M and smaller); for cutting secondaries No. 2 and smaller, and for cutting street circuits at taps controlling less than six lamps.

Large Guy Insulator—For insulating strand having an ultimate strength greater than 6,500 lb. and for cutting secondaries No. 0 and larger.

Red Glyptal Lacquer—For covering marred surfaces of good 24-kv. insulators.

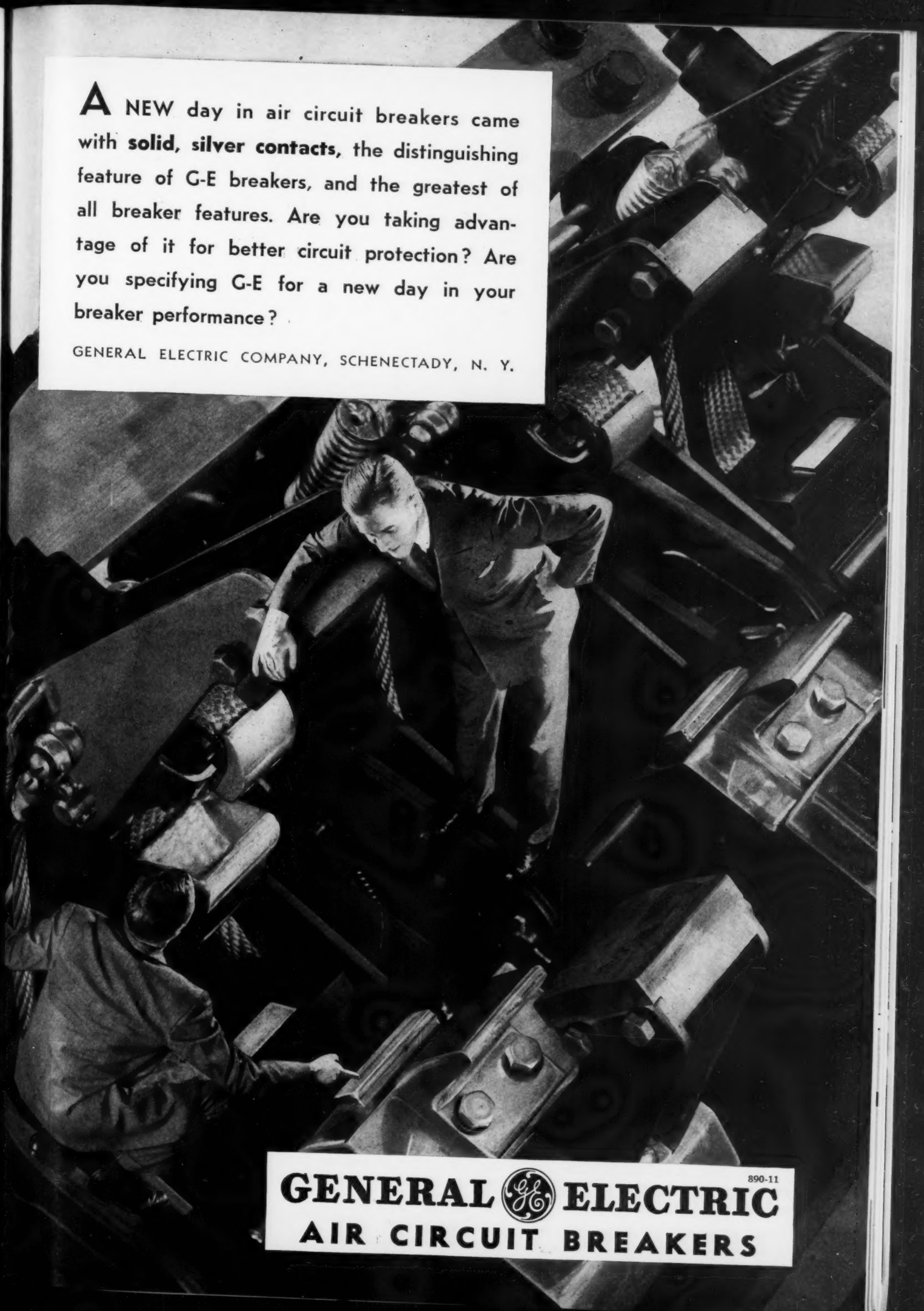
Pin type insulators shall not be installed with the bottom side up, since this would allow them to retain water.

Large guy insulators, when used with 10M and 16M strands, shall be protected by wrapping the strand with flat aluminum wire wherever the strand comes in contact with the porcelain.

A deadend spool shall be attached to a pole or an arm with a 5/8-in. bolt.

At a deadend the hook or clevis of a deadend assembly or of a 6-in. disk insulator shall be attached to an eye-bolt or eye-nut, and when a hook is used the open side of the hook shall be pointed downward.

* When deadending on a substation structure use insulators furnished by the construction bureau.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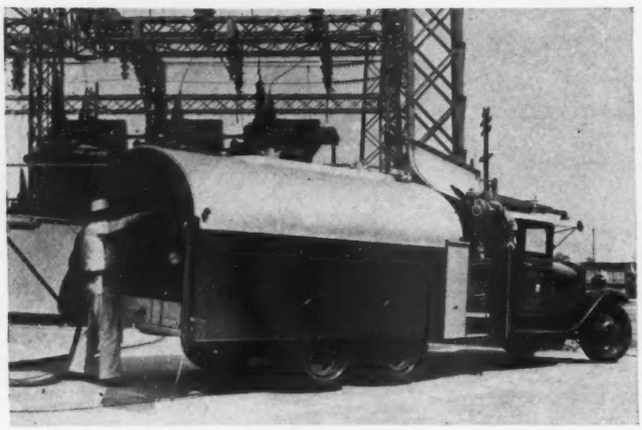

Portable oil-filtering plant, mounted on a 5-ton truck chassis, simplifies oil handling in Los Angeles Bureau of Power and Light Company substations

Rear compartment of portable oil-filtering plant. Oil can be handled at rate of 60 g.p.m., quantity being accurately controlled by suitable meters

Portable Plant Filters Breaker Oil

To expedite maintenance work on circuit breakers and transformers in the substations of the Los Angeles Bureau of Power and Light a new truck-mounted portable filtering plant has been placed in operation. Mounted on a 5-ton truck chassis, the plant consists of a two-compartment oil tank of 800- and 650-gal. capacity respectively. A standard filter and a dual drive pump and the necessary meters are provided in the rear compartment. Power for the pump can be either electric from substation supply or mechanical from a power "take-off" of the truck motor. For emergency use special tools necessary for overhauling oil switches and transformers are included in the equipment.

Oil handling has been expedited by the use of the truck with its double tank, which eliminates the need for temporary storage containers. When repairs are necessary the truck may be driven alongside the piece of equipment and the oil level there is lowered until repairs can be made. The truck was designed by A. B. Jones, operating division maintenance foreman, and built in the general plant division of the bureau.

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Decay Related to Creosote Penetration

More than 300 Southern pine poles treated with coal tar creosotes of varying types and that had been in use from five to 26 years were recently made the subject of a study to determine the relation between penetration and decay by R. H. Colley and C. H. Amadon. The poles studied were treated at thirteen different creosoting plants in the South and had been in lines that were under widely diverse climatic conditions in scattered locations east of the Mississippi River.

In the lines inspected the incidence of decay was definitely correlated with depth of penetration of the creosote and the depth of sapwood penetrated. Study of all the 3,102 poles inspected showed that:

1. There were 62 failures, all of which had penetration of less than 2.1 in. and 75 per cent of the sapwood thickness. The 62 failures were 2.00 per cent of the total poles inspected.

2. Of these failures 59, or 95.16 per cent, had penetration less than 1.8 in. and 60 per cent of the sapwood thickness.

According to the full report of Colley and Amadon in Vol. XV, No. 3 of the Bell System *Technical Journal*, poles in which the sapwood had been well penetrated with creosote were practically immune to destruction by fungi for a long time. It is also clear, the authors state, that if early failures and consequent replacement charges are to be reduced to a practical minimum it is essential to inspect treated poles closely and eliminate the poorly treated ones before they are used.

It is to be noted that no failures were found in poles having penetration of 2.1 in. and 75 per cent of the sapwood thickness. Current Bell System treating specifications are said to require a penetration of 2.5 in. or 85 per cent of the sapwood thickness. The accompanying table shows a summary of the penetration and failure data.

Summary of Penetration and Failure Data for 12-lb. Creosoted Southern Pine Poles in Line

Age of Line (Years)	Number of Poles Inspected	Number and Per Cent of Poles Having Penetration Less Than								Per Cent of Poles Having 100% Sapwood Penetration	Failures * Because of Decay in Poles Having Penetration Less Than			
		1.8" and 60%		2.5" and 85%		3.0" and 90%		3.5" and 90%			1.8" and 60%		2.5" and 85%	
		No.	%	No.	%	No.	%	No.	%		No.	% of Total Poles	No.	% of Total Poles
7.7	2,393	286	11.95	610	24.49	730	30.50	780	32.60	65.73	35	1.46	36	1.50
12.0	199	17	8.54	35	17.59	40	20.10	43	21.61	76.88	4	2.01	4	2.01
15.0	157	55	35.03	81	51.59	88	56.05	90	57.32	42.61	14	8.92	14	8.92
19.0	237	7	2.95	14	5.90	21	8.86	22	9.28	90.71	0	0.00	1	0.42
26.0	116	17	14.66	41	35.95	51	43.95	64	55.19	35.34	6	5.17	7	6.03
Total Poles	3,102										59	1.90	62	2.00

* There were no failures in poles having penetration in excess of 2.1 in. and 75 per cent of the sapwood.

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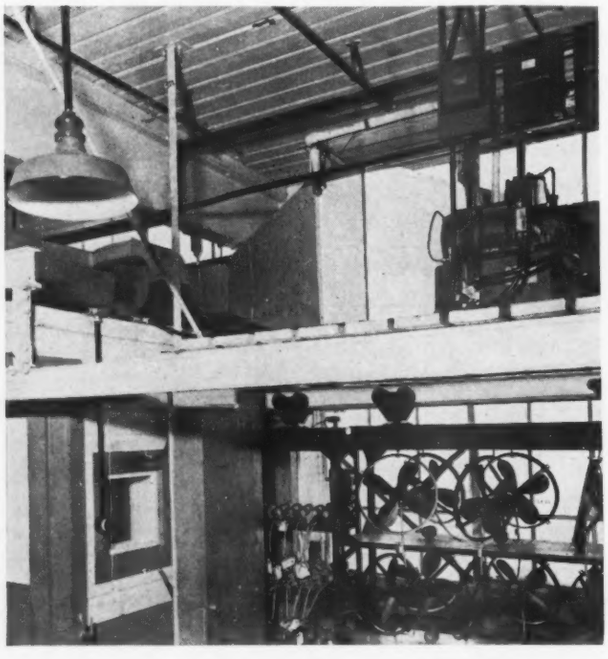
Condition Test Rooms to Improve Product

Air-conditioned testing departments for insuring greater accuracy and more comfortable working conditions for the operators are being used in the appliance manufacturing plant of the Westinghouse Electric & Manufacturing Company at East Springfield, Mass., with excellent results.

Appliances such as fans, food mixers and vacuum cleaners must be subjected to a final test designed to insure quietness of operation and high mechanical and electrical efficiency. This makes it possible to reduce to a minimum the chances of an imperfect appliance getting on the market. The final test is rigorous and conditions for testing are provided to insure thoroughness. Outside interference has been completely eliminated by air conditioning the test booths and soundproofing them.

Previously the ventilation of these test booths was taken care of by the addition and proper circulation of fresh air. In this system no means was provided for the removal of internal heat created by the appliances and operators. Consequently the temperature rose to an uncomfortable degree and the need for thorough air conditioning became apparent.

At present operators are working under ideal air conditions in these booths. Temperature is controlled and maintained at a comfortable point regardless of outside conditions, without sacrificing soundproofness. This is accomplished by means of a central conditioner and a distributing duct system which takes care of several test booths. The duct is lined with a sound-absorbing material and is connected to the test booths by means of canvas connectors. These features reduce noise transmission from the fan and other sources to a minimum.



Soundproof test rooms are air conditioned to insure more careful testing of appliances — Note arrangement of duct work above booths

Since the installations have been made it has been found that the operators are more alert and better fitted to conduct the tests completely and thoroughly.

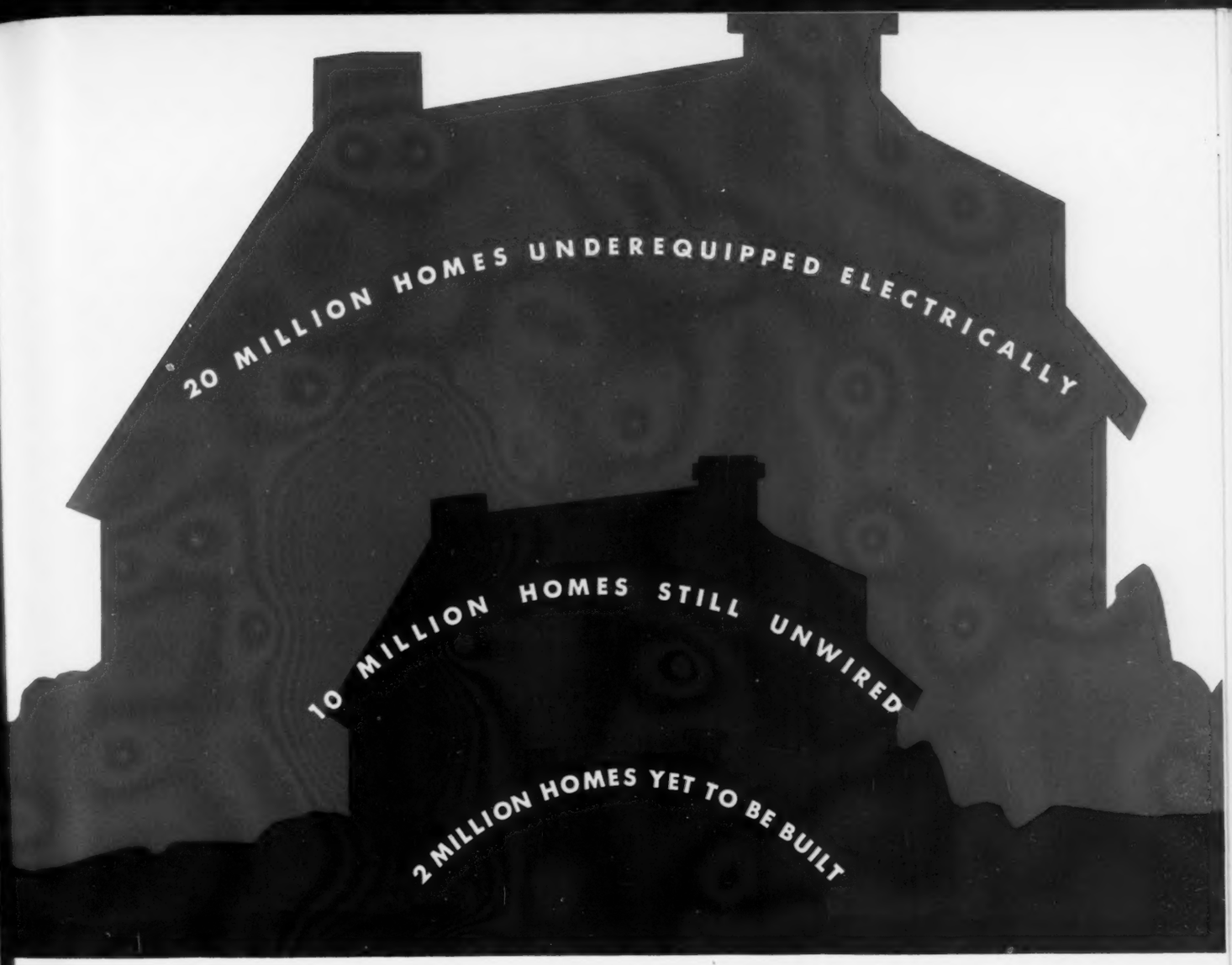
•

Reverberatory Furnace Melts Gold

Industrially electricity finds one of its widest applications in its ease of conversion to clean, even and automatically controlled heat. A particularly good example of the superiority of electric heat over competitive fuels is represented by a new high-speed electric reverberatory gold melting furnace constructed by the Pan-American Engineering Corporation, Ltd., of Berkeley, Calif., for the Bulolo Gold Dredging Company of New Guinea, Dutch East Indies. This furnace consists of a cylindrical shell supported horizontally and divided into two parts, the lower half containing the melting hearth and the upper half the firing chamber. Melting is accomplished by strictly reverberatory heating on the surface of the charge.

Heat is supplied by carborundum resistance bars, known as "Globars," which are capable of standing very high temperatures and, due to their crystalline surface, have a high heat radiation, the output being approximately 125 watts per square inch of surface area. The resistance bars are connected to the electrical circuit through water-cooled tubes and held in place under a heavy spring tension so that they float in the firing chamber and are free to expand and contract without impairing the electrical contact.

Costs of operation are low due to



Who's going to satisfy this demand?

a better installation for the power company. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus,* 1313 St. Paul Avenue, Milwaukee, Wisconsin.

million homes need new electrical equipment. 10 lion homes haven't any at all. 2 million homes yet to built will have to be supplied. The biggest market of time for household electrical equipment lies just ahead! o's *going to supply this demand?* The merchandiser who ows what kind of equipment sells in a rising market , and who offers that to his prospects . . . quality equip- nt, *dependable* equipment. When it comes to Meter d Service Entrance Equipment, be sure that you fea- e Cutler-Hammer . . . it's a better investment for the user, a better sale for the contractor,

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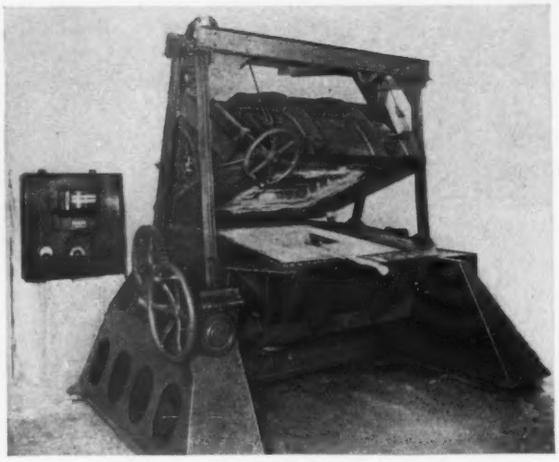
C-H

is
BETTER SERVICE EQUIPMENT
BETTER FOR THE POWER COMPANY
BETTER FOR THE CONTRACTOR
BETTER FOR THE USER

The non-interchangeable main and range switch pull-outs illustrated at the left are one of the many features of the Cutler-Hammer Range Switch (Cat. No. 4334H15). They illustrate as well the care exercised by C-H to meet the practical needs of the field.



Insulation surrounding the furnace shell is 13½ in. thick and consists of 4½ in. of a light-weight refractory brick backed up by 9 in. of a monolithic insulation composed of calcined diatomaceous material bonded with ordinary portland cement. The cement itself is kept from entering the pores of the diatomaceous material and merely bonds the particles together, allowing them to retain their full insulating properties. This is accomplished by first saturating the material with water and working dry cement into the mixture. So insulated, the shell itself never exceeds 90 deg. C. when thermal equilibrium is reached.

Control is entirely automatic, the power contactor being actuated by a suitably protected platinum-rhodium thermocouple inserted in the firing chamber. Of particular interest is an interval timer known as a "reduced input controller" which operates once every 60 seconds and controls the actual period during which power flows through the heating elements. This controller is graduated from 0 to 100 per cent and when set at 20 per cent, for instance, turns the current on the heating elements once each minute and allows it to remain on for 12 seconds. Thus, it is off for 48 seconds and on for 12 seconds of each ensuing minute, the net result being that, by a simple adjustment of this small dial, the rate of heating may be controlled, the permanent change of resistance elements with age compensated for and a longer life under less severe operating conditions is assured for the resistance elements than would be the case if tapped transformers or variable voltage devices were used.

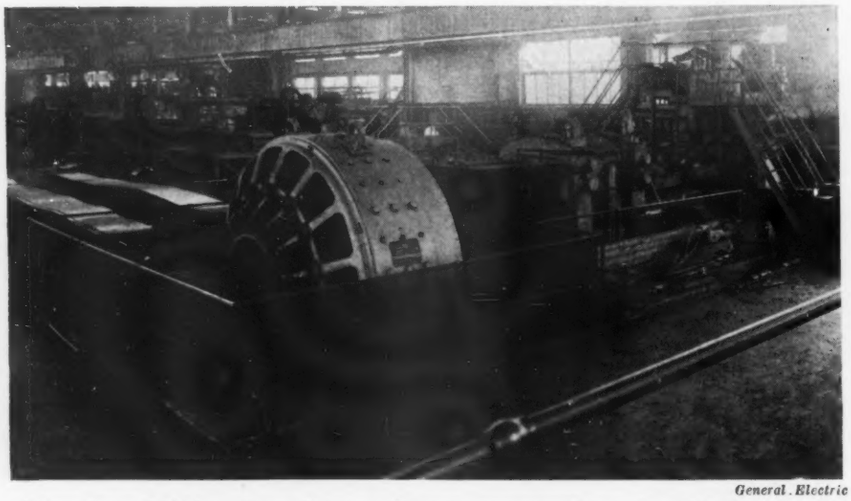
Electric reverberatory gold melting furnace improves operation and lowers costs of gold refining

the thick, efficient insulation combined with the direct application of heat to the reverberatory melting process made possible by electricity. A minimum amount of heat is wasted, the actual B.t.u. requirements converted into kilowatt-hours for melting 400 lb. of gold in this furnace being as follows: Water-cooled terminal loss, 20 kw.-hr.; heat loss through insulation, 20 kw.-hr.; total heat required to melt the gold, 30 kw.-hr.; total, 70 kw.-hr.

To the above must be added the heat loss in opening the furnace for charging and for miscellaneous safety factors, which will bring the total to approximately 140 kw.-hr. for a melt of this size. Cost comparisons of electric heat with other fuels for this type of service provide interesting data. With Diesel oil at 5 cents per gallon and electricity at 7 mills per kw.-hr., the oil required to make the melt would cost approximately $3, while electricity would cost but $1. At Bulolo, where the cost of gasoline and oil due to high transportation costs is 80 and 60 cents per gallon respectively and the cost of electricity, due to available hydro-electric power installations on the job does not exceed 5 mills, the saving by using electric heat becomes very great indeed, being in the order of $64 per melt with gasoline and $48 per melt with oil.

Other advantages realized by the electric furnace are the minimum heat radiation (important in tropical countries), silent operation, freedom from fire hazards and cleanliness, all of which contribute to lower costs and a lessened liability from theft.

1,000-Hp. D. C. Drive for Breakdown Mill



General Electric

Driven by a 1,000-hp., 40 to 60-r.p.m., direct-current reversing motor, this 28-in. breakdown copper mill in the Rome, N. Y., plant of Revere Copper & Brass, Inc., receives hot billets, weighing over 600 lb., direct from the furnace, rolls them into strips and delivers them to the pickling baths. Control is automatic and is concentrated at the pulpit, from which one operator controls the approach tables, the main motor, the edging motors and the tables delivering the strips to the pickling baths.

Welded Beam-Column Assembly Described

Investigations carried on at Lehigh University with regard to the safest, most economical method of joining floor beams to upright columns have produced a method of design that is said to be applicable to a wide range of lightweight beams of moderate length. This method is called the top-angle connection and is described in a paper presented at the recent annual meeting of the American Welding Society by Prof. Inge Lyse and C. D. Gibson. A steel projection or angle is welded to each of two columns, the ends of the beam are supported on the angles and then additional angles are welded to the top of the beam and to the column. Tests showed the best arrangement of the angle seats so that failure of the assembly under excessive load occurs at the center of the beam rather than at the angle connections.

Tests upon which the design method is based were made on full-size floor beams welded to heavy structural steel columns and indicated that welds produced in this way were remarkably tough. Steel rods, covered with a thick layer of slag-forming materials, were used as electrodes. As the steel core melts from the heat of the arc, part of the covering melts to form a protective slag coating on the molten steel puddle, and the remainder is gasified and forms a cloud around the molten puddle.

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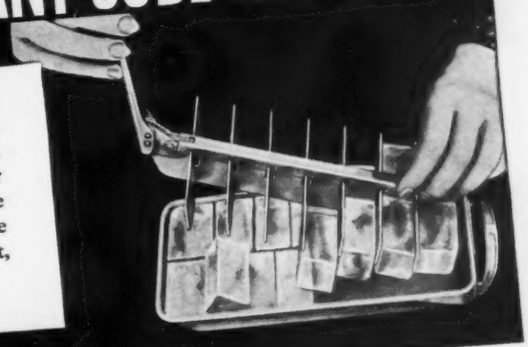

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Housewives have never seen anything like this for work-saving and convenience! Includes a 2-way Frozen Storage Compartment . . . 2-way Cold Storage Tray . . . 3-way Sliding Shelf . . . a 2-way Multi-Storage Section. 9 quick, easy adjustments, with dozens of variations to suit every kind, size, shape of food or container! STORAGE-ABILITY never known in home refrigeration before!

. . . *and of course, the* METER-MISER

Most talked-about refrigerating mechanism in the industry! Cuts current cost to the bone! And proves it to you with an actual electric meter test! Meter-Miser gives SUPER-DUTY at amazing saving because it's *the simplest refrigerating mechanism ever built!* Only 3 moving parts, *including* the motor . . . permanently oiled . . . sealed against moisture and dirt. An exclusive Frigidaire economy advantage with unbeatable sales-closing power!

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Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

Better Light on the Type

By FRANK D. CHASE
Consulting Engineer-Architect, Chicago

How the architect may employ the newest developments in industrial lighting is well illustrated in the rehabilitation of the plant of the Chicago *Journal of Commerce*, recently completed under our supervision. While the plans for the mechanical department were being prepared a sample installation was made of one of the new "Skylight" units developed by the Chicago Lighting Institute especially for the illumination of type surfaces. The even, shadowless light from the unit is designed to eliminate reflected glare from the tiny bright facets of the type, usually so hard on the printer's eyes. The unit, having proved very satisfactory in the demonstration, was specified for the entire composing room lighting.

The installation includes 27 of these units, each equipped with two 200-watt lamps, lighting the working surfaces to an intensity of 22 ft.-candles. Ten of the units are lined up over the make-up alley as shown in the accompanying illustration. Over the type cases six are used, one over each case. The eleven other units are installed at the proof press and over the imposing stones and storage tables.

Benjamin Electric Mfg. Co

Skylight units save printers' eyes

•

Utility Uses Films in Range Campaign

Selecting theaters according to their drawing power among families largely unfamiliar with conveniences of electric cookery, the Indianapolis Power & Light Company is sponsoring a series of brief commercial news reels before approximately 130,000 Indianapolis theater-goers in a campaign designed to step up domestic consumption through stimulation of the sale of electric ranges.

Commercial news reels in Indianapolis theaters are one of the features of a campaign which also includes newspapers, radio, outdoor and direct mail advertising, all of which is bringing direct results.

The response from the campaign is directed to local dealers as part of a city-wide dealer co-operative plan sponsored by the electric company. A number of electrical dealers have expressed themselves as being well pleased with this local publicity in their neighborhoods, according to Indianapolis Power & Light officials.

The film portion of the campaign embraces the showing of several minute-movies in fifteen different theaters throughout the city, with the films dramatizing the advantages and economies of electric cookery. An important factor in the choice of theaters was the desire to obtain coverage in neighborhoods where co-operating dealers have stores. The Alexander Film Company of Colorado Springs, Colo., produced the films and is handling screening arrangements.

The films also emphasize that all leading dealers offer trade-in allowance, free installation, low monthly payments and expert service to electric range buyers. In picturing the cleanliness of electric cookery, a housewife proves that she can wipe a pan with a white silk dress—after the pan's use on the electric range—without leaving a mark on the dress.

Audiences further are told that vegetables lose almost half of their

No. 5 of a series

Utility Outlay Amounts to $1,538,000,000

Indicate Fair Weather for Industry

Rural Mileage Expected to Exceed 36,000 in 1937

New Stations Will Total 1,270,000 Kw.

Government Power Projects Aggregate $1,300,000,000

Utility Budget Up to $635,434,000

Industry Extends

This type of buying is more than a "flash in the pan"

The facts are available — utility capital expenditures will increase some $100,000,000 in 1937 — sales budgets for major electrical equipment are up 15 to 50% — industrial plants are continuing to expand and modernize through electrification — electric energy production is breaking all records. The facts in Electrical World's January 2nd Statistical issue reflect a year of growing opportunities ahead.

Manufacturers who are progressing at a faster pace are gearing their advertising to this increasingly ACTIVE MARKET — through Electrical World, of course. Through the business-stimulating pages of Electrical World, they are keeping pace by broadcasting their bid for business to the key electrical men throughout industry.

You can "go places" with Electrical World. May we send you complete details?

ABC **ELECTRICAL WORLD** ABP

A McGraw-Hill Publication

330 West 42nd St., New York, N. Y.

successfully serving an

ACTIVE MARKET

demands a publication with

EDITORIAL VITALITY

which in turn makes

KEEN READERS

who are preferred by

ALERT ADVERTISERS

• • • • • • • • • • • • • •

that's Electrical World

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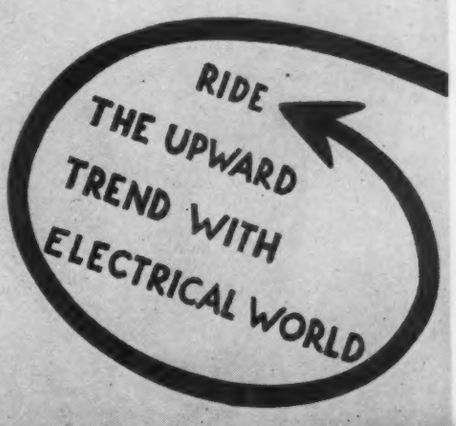
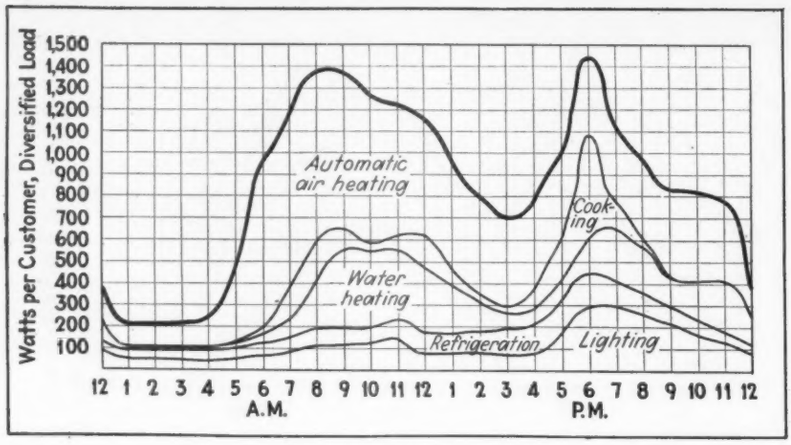




Total daily load curve

healthful minerals when boiled by ordinary methods, yet retain their full nourishment when steamed in one-half cup of water over an electric range, without danger of burning.

•

Combined Appliances Give 40% Load Factor

By FRED R. GROCH*
Wesix Electric Heater Company,
San Francisco, Calif.

This analysis of domestic loads demonstrates the need for the aggressive selling of all major appliances to obtain the highest load factor and hence the maximum number of kilowatt-hours per kilowatt of demand. Annual load factor is a measure of economy to serve; the highest is produced by the use of all types of major appliances rather than by the use of one type only. As shown later, it is possible to secure a factor of 40 per cent in this fashion.

In the accompanying illustration are superimposed typical diversified daily load curves for the principal types of domestic load. Each curve represents the average diversified load per customer for a large customer area on the peak day of the year. The data for the construction of the curves were obtained from several sources. Curves of this type differ somewhat for different localities, depending on climatic conditions and habits of use of appliances, but, in general, the difference in shape and peak of the diversified load curve is too small to affect the results of this study.

Annual load factor, as shown in the accompanying table, is the ratio of average kilowatts to peak demand in kilowatts. The table shows this factor for various combinations of appliances. Annual kilowatt-hours—from which average kilowatts were calculated—are based on the average consumption per customer multiplied by the saturation. Saturation figures used are what normally might be expected in an area where the use of electricity is progressing rapidly, but is subject to fuel consumption.

Two peaks, approximately equal, are shown; one occurs in the morning hours, one in the evening. Examination of the proportion of each load making up each peak reveals the value of each type of load. Thus, without water heating and automatic air heating, cooking would add disproportionately to the peak, which would be an evening peak only. With the balanced load conditions shown, cooking is a valuable part of the total load, since it raises the evening load, which would otherwise be low.

* Taken from a talk delivered at the conclave of the Pacific Coast Electrical Association.

Cumulative Effect on Load Factor of Adding Major Appliance Load

Type of Load	Saturation, %	Annual Kw.-Hr.	Average Watts	Peak Watts	Annual Load Factor, %
Lighting	100	790	90	300	30
Lighting	100				
Refrig'n	80	1,510	173	440	39
Lighting	100				
Refrig'n	80				
Cooking	60	2,230	255	910	28
Lighting	100				
Refrig'n	80				
Cooking	60				
Water htg.	30	3,530	403	1,080	37
Lighting	100				
Refrig'n	80				
Cooking	60				
Water htg.	30				
Air heating	15	5,030	574	1,440	40

Starting with lighting and small appliance load at 30 per cent annual load factor, the addition of refrigeration raises the load factor to 39 per cent. Addition of cooking to lighting and refrigeration drops the load factor to 28 per cent. The further addition of water heating raises the load factor to 37 per cent, and automatic air heating added to that results in the highest load factor, 40 per cent.

•

Education Needed to Build Farm Load

By FRANK M. MASON
Farm Service Agent
Detroit Edison Company *

Most utilities are willing to make liberal investments in farm line extensions provided the load justifies the investment. In our company the financial justification for the building of a farm line was based on the probability that within five years from the date of completion the total revenue would offset the company's investment. In a great many cases these farm lines are not earning their own way because the farmer does not make sufficient use of the available service, inasmuch as he has not yet been taught the profitable use of complete electric service.

Our company decided to find out to what extent some of its farm customers were putting electricity to work and this year completed a survey of one entire county, containing 4,205 farms, in territory surrounding the city of Mount Clemens. This county of Macomb was selected for

* From paper to Rural Electrification Conference, Purdue University.

Appliance Purchases in 1937

In 1937, in the average community of wired homes, the General Electric Company predicts that

One in every 12 wired homes will buy a refrigerator
One in every 18 wired homes will buy a washing machine
One in every 24 wired homes will buy a vacuum cleaner
One in every 70 wired homes will buy an electric range
One in every 137 wired homes will buy an ironer

This prediction is based on industry sales for 1936.

the survey for two reasons: (1) It has the highest saturation of farms served and (2) the greatest number of farms having long service periods. The survey revealed the following:

	Per Cent
Farms with service	95.2
60-ampere service entrances	34.8
Lighted barns	70.4
Lighted poultry houses	51.9
Water supply	44.1
Pump jacks	12.3

Saturation of the usual household appliances:

	Per Cent		Per Cent
Hand irons	89.0	Ranges	16.9
Radios	84.4	Refrigerators	15.5
Washing machines	71.1	Clocks	12.1
Vacuum cleaners	45.8	Percolators	11.0
Toasters	44.5	Waffle irons	10.2
		Water heaters	0.46

These figures reveal that many of the home applications of electricity are quite well accepted and less effort on these will be required in the future. However, when we view a few of the applications outside of the home we find an entirely different picture. Following is shown the saturation of a few of the applications in farm equipment:

	Per Cent		Per Cent
Tool grinders	6.8	Incubators	1.3
Brooders	5.6	Feed mills	0.9
Utility motors	2.4	Milk coolers	0.4
Milking machines	1.4	Irrigation	0.3

Electric Heat for Two French Churches

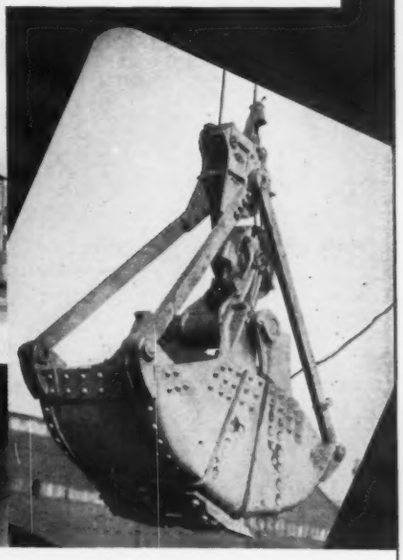
Rural load builders may find a suggestion in an installation of electric heating tubes in two small rural French churches, as described in the *Electrician* (London). The tubes, with a load of 300 watts per meter length, are about 3 in. in diameter to avoid too great a surface temperature and are placed under the hassocks in the pews, producing a layer of heated air near the floor which heats the worshipers as it rises. These tubes are controlled by groups of six from a switchboard in the sacristy, which, in each church, is heated by a 3-kw. portable radiator. The confession booths are heated by short tubes, each about 20 in. long, two being used in each booth.

Altar heating differs in the two churches; one is heated by three radiators of 1 kw. each, the other has tubes 3 meters long placed in a sunken groove in the floor. The total load at one church is 35 kw.; at the other it is 72 kw. Both churches are in the mountains at an altitude of about 3,000 ft. and the winters are usually severe.

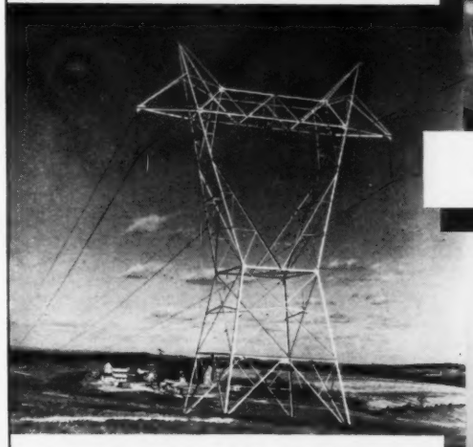
BLAW-KNOX Products
for public utilities

The merit of Blaw-Knox Products has been endorsed by their acceptance under the rigid standards of Public Utility purchasing for more than 2 decades

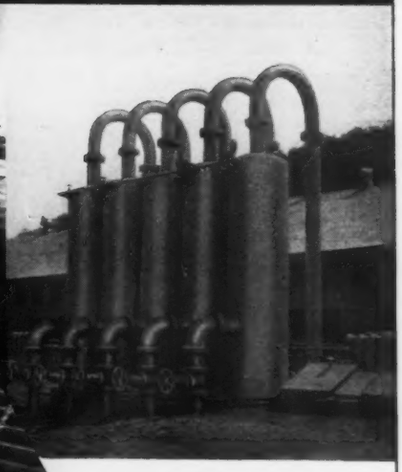
STEEL BUILDINGS



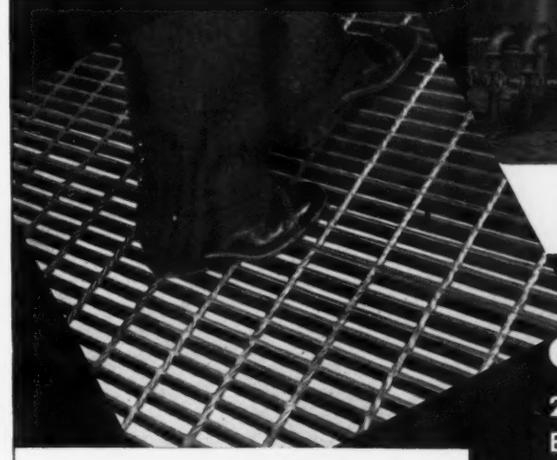
CLAMSHELL BUCKETS



TRANSMISSION TOWERS



GAS CLEANERS



STEEL GRATING

BLAW-KNOX COMPANY
2013 FARMERS BANK BUILDING
PITTSBURGH, PA.

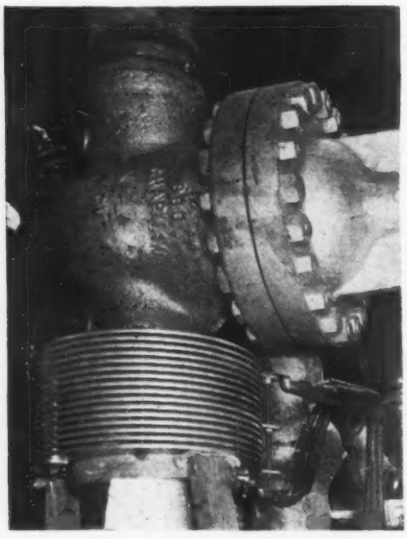
New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Relieving Stress in Welded Pipe Joints

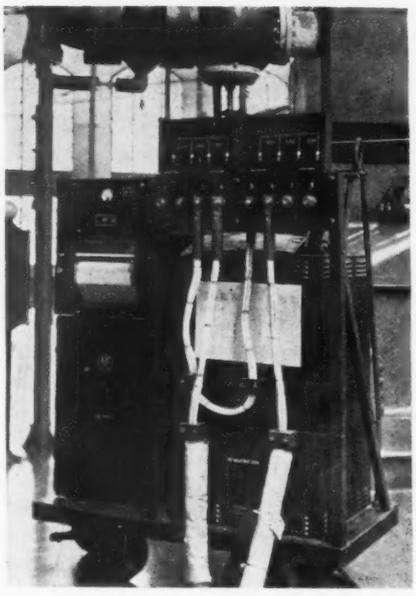
By C. M. WEINHEIMER
Chief Engineer Detroit Electric Furnace Company, Detroit, Mich.

Low ductility and low shock resistance resulting from uncontrolled natural cooling of the metal are common deficiencies in piping welds made in the field. These deficiencies can be eliminated by stress relieving; *i.e.*, heating the weld and adjacent pipe to some temperature, usually 1,100 to 1,200 deg. F., and allowing to soak for a definite time. At this temperature the stresses, which were set up when the weld metal cooled rapidly, are reduced. thus increasing the ductility about 50 per cent and raising the shock or impact strength 15 per cent or so. This operation can easily be carried out in shop welding, but for welds made in the field it has not heretofore been so readily done.



Electric stress reliever at work

Here is a valve welded into a steam line in the Steel Point station of the United Illuminating Company at Bridgeport, Conn. The pipe-carbon-molybdenum seamless tubing is for 625 lb. W.S.P. and 850 deg. F. total temperature. Note the weld above the valve and the stress reliever applied to the one below.



Current supply and control for stress reliever

In the lower left corner of the portable equipment assembly is the primary switch and above it the temperature control and recording instruments. The secondary of the transformer is wound in two sections with end and intermediate taps brought out to a row of numbered studs. By means of lead and jumper connections to the studs additive and subtractive polarity connections can be set up between the two sections of secondary winding to get a wide range of voltage.

But it can be done now very handily by use of the electric stress reliever shown in the accompanying illustrations. The weld is heated by induction from a heavy current helix of flat bars which is clamped around the pipe over the weld. The helix is opened and closed in the same manner as the split core of an instrument transformer, but the bars are insulated from each other so that when the clamp bolt is tightened there results a continuous multiple turn coil.

Accurate temperature control and record of the operation are obtained by means of a thermocouple and potentiometer combination. The amount of electricity used is small—for instance, 25 kw.-hr. for treating a weld in a 14-in. pipe—and therefore the expense of operation is low. However, the equipment, including the stepdown transformer and the necessary control and recording devices, is comparatively high in cost, when only a few welds are to be treated. For this reason the manufacturer is making plans to offer some of the stress relievers on a rental basis.

•

Devises New Control of Prime Mover Speed

By FRANK I. MORGAN
Baltimore, Md.

A method of electrically controlling the speed of hydraulic turbines (or other prime movers) has been developed which has the advantages of very small inertia, great sensitivity, easy and positive control, energy requirements approximating an indicating instrument, elimination of restoring rods, bearings and bell cranks, and which is not affected by friction in the pilot valve. The control equipment can be placed in any convenient location. By its use old governors can be modernized at comparatively low cost.

This electrical governor consists of a frequency meter which controls solenoids actuating the pilot valve. Compensation is obtained by means of variable resistances which are operated by the wicket gate servo-motor.

A THOUSAND POSITIONS!

That's the flexibility we build into the

CROWSNEST

Such flexibility makes the Murray Demountable Crowsnest adaptable for servicing street and traffic lights, trimming trees, line inspection work, servicing fire alarm signal systems, connecting services, overhead construction work, painting standards, mast arms, poles and transformers — speedily and efficiently.

Safety, speedy operation, flexibility and durability are the fundamentals on which the Crowsnest has been designed.

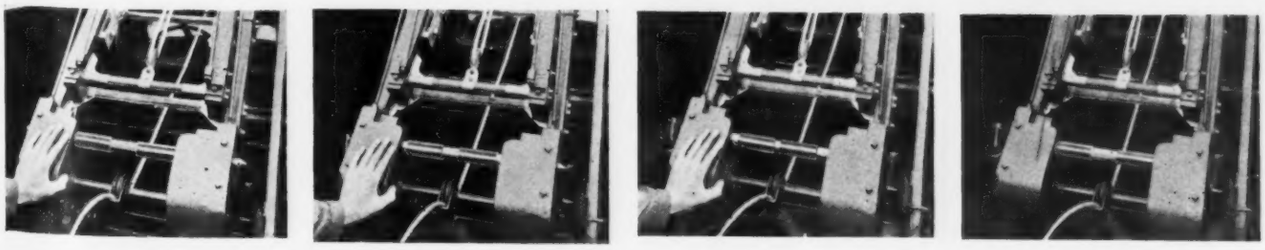
Tests recently pictured in our advertisements disclose a factor of safety beyond any normal requirements and evidence the sound engineering design and the quality materials used in its construction.

The Crowsnest is extremely fast to operate. Erection is semi-automatic—see illustrations —there are 10 angles of inclination to choose from—rotation if required, is quickly done with little effort, for the base of mounting frame is fitted with ball bearing rollers. "SPOTTING" with such flexibility to call upon, is no problem.

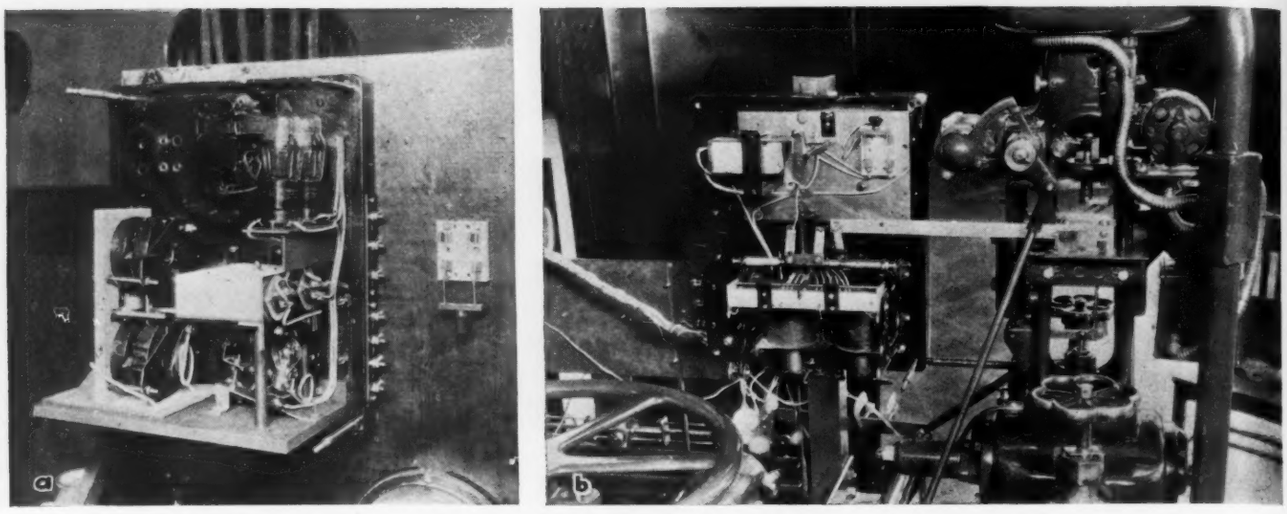
Give your men this modern equipment to surmount the hazards they are constantly confronted with and accidents will disappear—costs are bound to be reduced.

We'll gladly send complete details—tell us to do so today!

METROPOLITAN DEVICE CORP.
1250 Atlantic Ave., Brooklyn, N. Y.



MURRAY DEMOUNTABLE CROWSNEST



Frequency meter (a) controls the solenoids (b) which actuate the pilot valve

Being a "null" method, the action of the controlling element (frequency meter) is independent of changes in voltage within wide limits.

An experimental application of this device has been made to a 3,000-hp. turbine operating under a head of 55 ft. The results obtained have been very encouraging and indicate that the method has interesting possibilities. A very steady speed is maintained at no load and synchronizing is done, under governor control, without difficulty. The governor responds promptly to small fractions of a cycle change in frequency (60 cycle). Sudden increases in load are handled in a satisfactory manner. Rejection of heavy loads results in prompt closure of the gates with no hunting about the no-load position.

Remote control starting and stopping of the unit by means of this equipment is very satisfactory. Transfer from governor to manual control or *vice versa* is accomplished by simply throwing a switch.

•

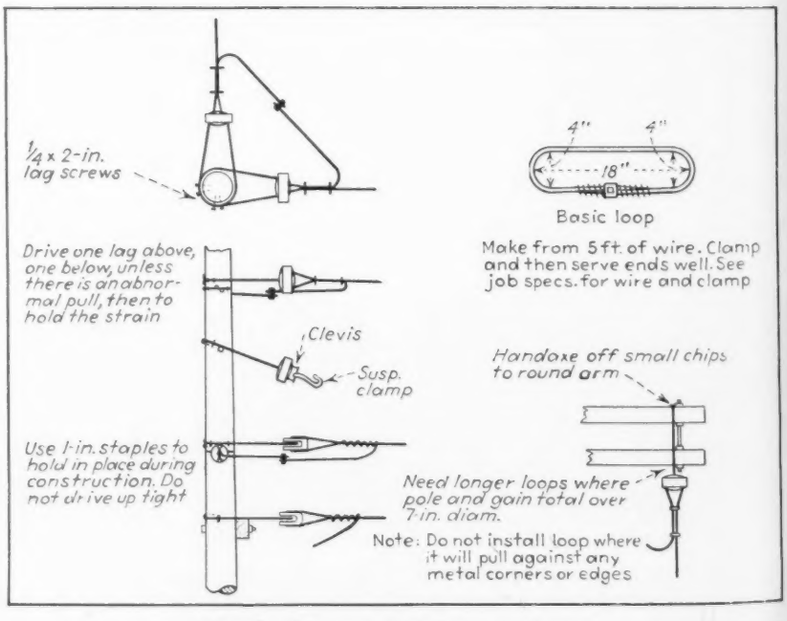
Loop Deadend Saves Money

By E. A. BOWMAN
Electric Distribution System Engineering, Roxie, Miss.

A new type of deadend, designed by the author and called the "Bo type," that we are using in light rural lines for which we design the specifications, has proved a success and a definite factor in reducing line construction costs. The accompanying drawing shows the basic loop and its use on primary deadend, pull-off and secondary deadend. The loop is made of small guy wire or copperweld of sufficient strength to hold any conductor used on the job. It is held together by a one-bolt clamp or a clip and the ends served. Insulators are of the Hewlett or guy type to meet voltage needs. On new work the deadends are usually assembled at the warehouse by linemen on rainy days or at some odd time before poles are placed for framing.

The deadend is attached, when warehouse-made, by slipping over the pole top, driving in the lags and using a few staples to hold it in place during construction. On reconstruction or additions where it cannot be slipped on the loop must be clamped and served by a lineman on the pole. Even then its cost will compare favorably with the total cost of boring the hole and installing most eyebolts and clevises.

Usual cost of this deadend is less than 25 cents plus the insulator, which is considerably less than most types in use. No drilling is necessary for deadend or corner poles, thus lowering cost and helping to eliminate unfilled holes where rot or woodpeckers start. Practically all eyebolts, eyenuts, bolteyes, etc., and assorted clevises are eliminated. This reduction in the number and variety of material items helps in many ways. The same deadend can be used on poles or arms and irrespective of hardware sizes. Savings in pole space at angles, etc., are also made.


¼ x 2-in. lag screws
4"
4"
18"
Basic loop
Make from 5 ft. of wire. Clamp and then serve ends well. See job specs. for wire and clamp
Drive one lag above, one below, unless there is an abnormal pull, then to hold the strain
Clevis
Susp. clamp
Handaxe off small chips to round arm
Use 1-in. staples to hold in place during construction. Do not drive up tight
Need longer loops where pole and gain total over 7-in. diam.
Note: Do not install loop where it will pull against any metal corners or edges

Simple, low-cost deadend attachment

FOURTH YEAR FOR L-M TYPE "C"

LIGHTNING ARRESTERS

First going into service in 1934, L-M Type "C" Lightning Arresters are today protecting transformers on four continents. The fast, rugged L-M spark gaps and Granulon valve material insure electrically fast operation and high surge capacity. Double sealing against moisture adds extra years of protective life. The transparent PYREX housing permits instant inspection. Available in all the standard ratings. Write to South Milwaukee, Wisconsin, for full information.

LM

LINE MATERIAL CO.

News ABOUT PEOPLE

Hale and Woolley of Utah Given New Executive Duties

J. A. Hale, chief engineer of the Utah Power & Light Company, has been appointed vice-president in charge of operations of that utility and of the Utah Light & Traction Company. Jed F. Woolley, Jr., chief engineer of the Utah Light & Traction Company, has been named manager of that company, succeeding E. A. West, who is now connected with the Florida Power & Light Company.

Mr. Hale first became associated with Utah Power & Light in 1913. After short connections with the reclamation service in Utah, the U. S. Housing Corporation and the Wattis-Samuels Company on Utah highway projects in 1918 and 1919, he again joined the staff of Utah Power & Light late in 1919 as construction engineer. In 1926 he was made chief engineer.

J. A. Hale

Mr. Hale is a member of the A.I.E.E. and a past-president of the Utah Society of Engineers.

Mr. Woolley entered the employ of the Utah Power & Light in 1919 and worked in both office and field on dam and power plant contruction until 1927, when he joined the Utah Light & Traction Company as superintendent of way and structures. He has held the position of chief engineer for the past seven years.

J. F. Woolley, Jr.

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Blaw-Knox Elects Officers

Announcement has been made by the Blaw-Knox Company that Frank Cordes, president, has been elected chairman of the board of directors. Chester H. Lehman, vice-president, was chosen as vice-chairman of the board and executive vice-president and William P. Witherow was elected president to succeed Mr. Cordes. H. B. Lexterman has been named a vice-president and Albert L. Cuff, secretary.

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▶ ARTHUR F. DAVEY, manager of the Sheboygan division of the Wisconsin Public Service Corporation, was tendered a testimonial banquet recently by officers of the organization in honor of his completing 25 years of continuous service with the utility.

Daniels Heads Sales Forces of Boston Edison Company

Julius Daniels has been appointed head of the Boston Edison Company's commercial bureau, succeeding Louis R. Wallis, who has been made assistant to the vice-president and general manager after many years of distinguished service as superintendent of the sales department. Mr. Daniels joined the company's staff 24 years ago and is a past-president of the Illuminating Engineering Society, also being president of the Boston Air Conditioning Bureau. He was recently appointed assistant head of the commercial bureau, which also guides the promotion work of the company. Mr.

J. Daniels

Wallis has attained a high reputation in the field of industrial energy sales, both for his analytical capacity and executive ability. Both men are widely known throughout the electrical industry and have played important constructive parts in its larger organizations.

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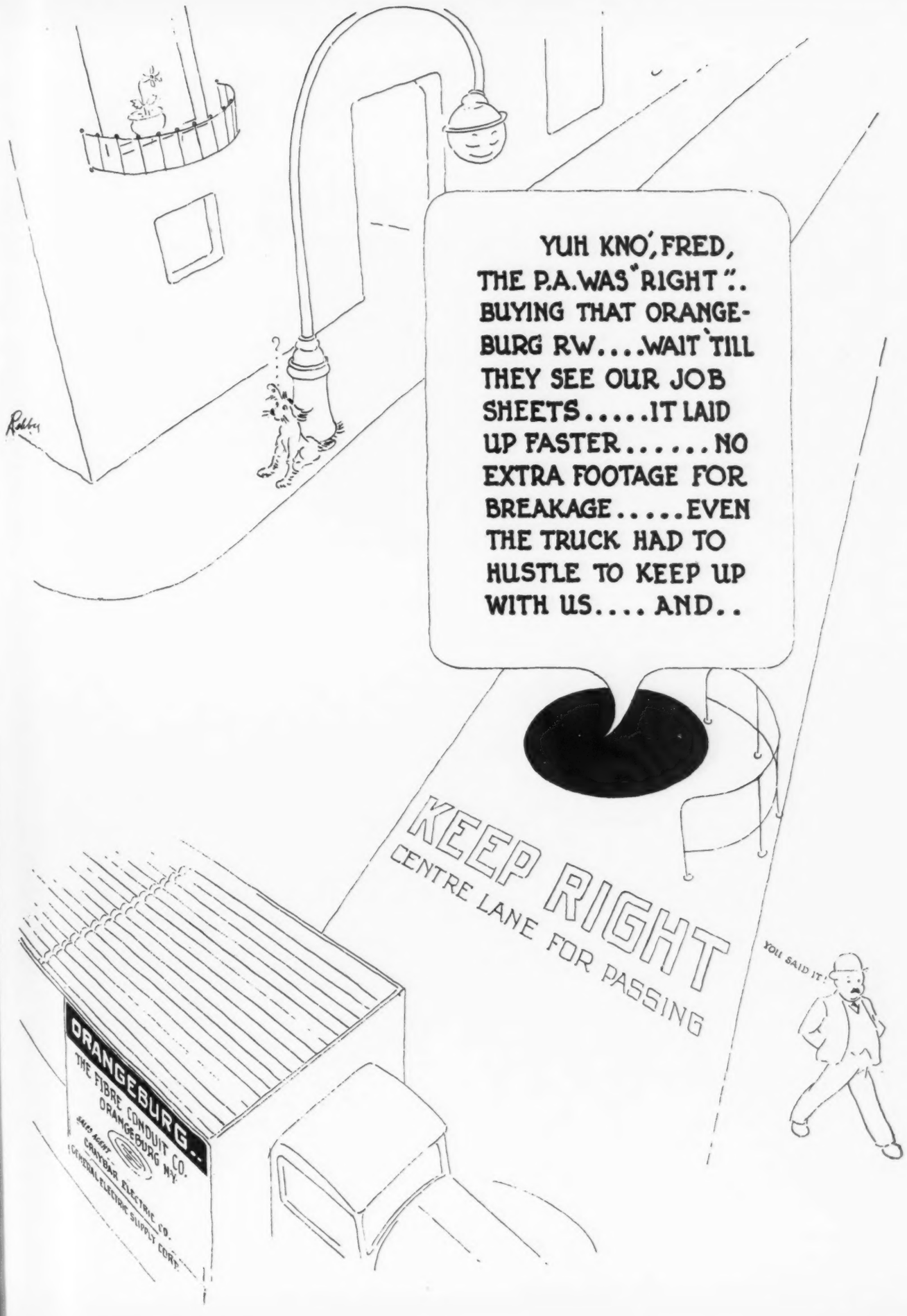
▶ L. L. PERRY, who has been commercial and new-business manager for the Wisconsin Power & Light Com-


YUH KNO', FRED, THE P.A. WAS "RIGHT".. BUYING THAT ORANGE-BURG R.W....WAIT 'TILL THEY SEE OUR JOB SHEETS.....IT LAID UP FASTER.....NO EXTRA FOOTAGE FOR BREAKAGE.....EVEN THE TRUCK HAD TO HUSTLE TO KEEP UP WITH US.... AND..
KEEP RIGHT
CENTRE LANE FOR PASSING
ORANGEBURG
THE FIBRE CONDUIT CO.
ORANGEBURG N.Y.
SALES AGENT
CRANEBAR ELECTRIC CO.
GENERAL ELECTRIC SUPPLY CORP.
YOU SAID IT!

pany the past two years, has been appointed to a similar position for a number of utilities in Missouri that are under the management of the Middle West Corporation.

▶ A. DEAN DUDLEY, president of the Syracuse Lighting Company, Syracuse, N. Y., sailed recently on the French liner *Paris* from New York for a six weeks' stay in Europe.

▶ BERTRAM W. GOODENOUGH has been appointed by T.V.A. senior engineer in its construction plant division.

▶ BRITTON I. BUDD, for more than a quarter of a century an outstanding figure in the Chicago transit field, severed all his connections with the industry last week, when he resigned as co-trustee of the Chicago Rapid Transit Company and as receiver of the Chicago, Aurora & Elgin and the Chicago, North Shore & Milwaukee railroads. This action was taken to permit Mr. Budd to devote his entire time to the affairs of the Public Service Company of Northern Illinois, of which he is president.

▶ A. C. SCHWAGER, chief engineer of of the Pacific Electric Manufacturing Corporation, San Francisco, has been elected vice-president in charge of engineering. A native of Switzerland and a graduate of the Institute of Technology of Zurich, Mr. Schwager has been affiliated with the company since 1926. His previous connections include the Electrical Testing Laboratories of New York City, the New York Edison Company and the Pacific Gas & Electric Company.

▶ HOWARD E. WAY has rejoined the electrical division of the Bureau of Foreign and Domestic Commerce, which he previously served for a number of years. Mr. Way has recently worked with other divisions of the Commerce Department. He will conduct various foreign market studies in electrical goods and will assist with the division's publications. He has written several articles for the McGraw-Hill electrical publications.

▶ E. C. BROWN of the Connecticut Valley Power Exchange, Hartford, was elected chairman of the New England System Operators' Club at the recent annual meeting in Boston, and CLEMENT P. COREY, New England Power Company, Millbury, Mass., was made secretary.

Albert W. Higgins Assumes New Executive Duties

Albert W. Higgins, who since the early part of 1936 has been a vice-president of the Utility Management Corporation, New York, will assume charge of the Florida and Georgia properties of the Associated Gas & Electric System and has been elected president of the Florida Power Cor-

poration, St. Petersburg, to succeed Alex Speer.

During the past 35 years Mr. Higgins has had a wide experience in engineering work and with the utility industry in many sections of the country. He is a native of Boston and a graduate of the Massachusetts Institute of Technology.

•

▶ S. NEWSTONE of Montevideo was elected president of the Minnesota Electrical Association at the recent annual convention in Rochester. EDWARD KARST of Fergus Falls was named vice-president.

▶ THOMAS D. FULFORD, general sales manager of the Puget Sound Power & Light Company, Seattle, has been appointed general sales manager for the Virginia Electric & Power Company with headquarters in Richmond. PATRICK JOHNSON, assistant general sales manager, has been appointed general sales manager of the Seattle utility to succeed Mr. Fulford. Mr. Fulford has been engaged in sales work on Stone & Webster properties since 1919. Mr. Johnson's experience in the utility industry covers a period of about twenty years. He has been connected with Puget Sound Power & Light since 1929. H. C. WEBB, JR., sales manager of the Richmond division of Virginia Electric & Power, has been transferred to Seattle as assistant sales manager of Puget Sound Power & Light.

▶ J. R. PERSHALL, for several years advertising manager of the Public Service Company of Northern Illinois, has been given added responsibilities with the title of advertising and merchandise sales manager. He will continue in full charge of advertising and will also take over retail sales and merchandising problems. Mr. Pershall is a past-president of the Public Utilities Advertising Association.

OBITUARY

▶ JOHN S. POE, for many years associated with the Anaconda Wire & Cable Company as safety engineer, died February 24 in Yonkers, N. Y., at the age of 70.

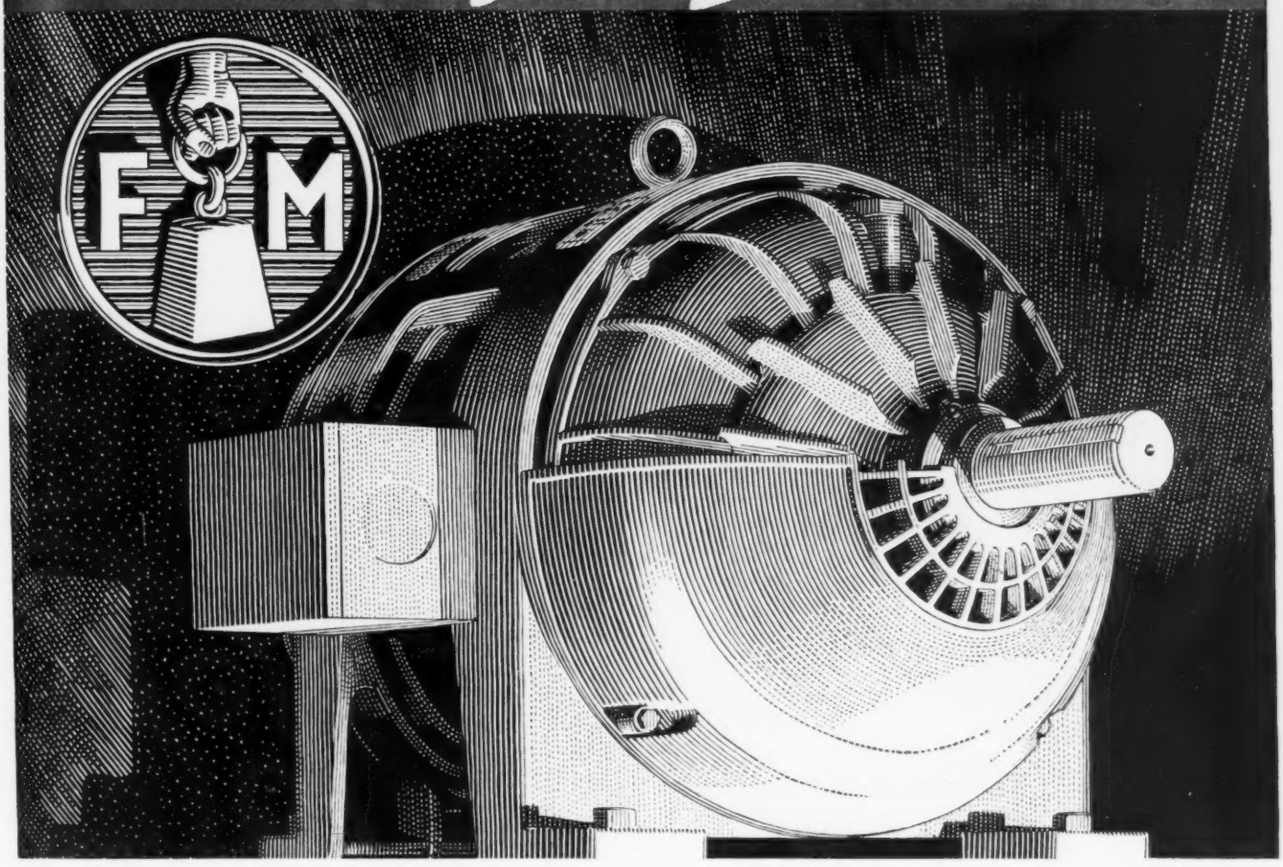
▶ ROBERT W. PERKINS, a vice-president of the Connecticut Light & Power Company, died February 21 at his home in Norwich, after an illness of several weeks.

▶ ARTHUR O. MINNICH, assistant to the president of the International Utilities Corporation, died February 24, as the result of an automobile accident, near Baquendang, Chile. Mr. Minnich, who was touring South America for International, was 38 years old.

▶ FREDERICK R. GLOVER, general executive assistant with the British Columbia Electric Company, died in Vancouver recently at the age of 77. Joining the B.C. staff in 1902, he won rapid promotion, and when he retired from active participation in the company's affairs a few years ago he retained the title of general executive assistant.

▶ EDWARD B. MERRILL, for many years connected with the Hydro-Electric Power Commission of Ontario, died recently, of pneumonia, in Toronto. Mr. Merrill recently relinquished active duties on the commission. Before joining the commission staff in 1914 he had been connected with the Westinghouse Electric & Manufacturing Company, Siemens Brothers & Company, London, England; the Toronto & Niagara Power Company and the city of Winnipeg Electrical Development Company.

DESIGNED FOR *Tough* SERVICE



● Three motors out of four that we sell go into normal motor service—where a standard open-frame motor will not encounter difficult operating conditions. But that fourth motor—it may be needed where dust or corrosive fumes fill the air . . . or in a machine shop where powdered emery or metallic dust would cut motor life down to a matter of weeks or months.

Obviously, the simple enclosing of an open-type motor would be to invite trouble, so our engineers started from base up to build an entirely new motor for tough services like these. Built-in fans on both ends of the motor shaft create their own ventilation system, eliminating "hot spots." The shaft runs on ball bearings that require lubrication no oftener than once a year. And, with all these advantages, the F-M fan-cooled motor is exactly the same in mounting size as regular open-frame motors.

If your service requires the extra protection that only a motor designed and built for tough service can offer, write for Bulletin F103 Fairbanks, Morse & Co., 900 South Wabash Avenue, Chicago, Illinois. 34 branches at your service throughout the United States.

6934-EA40.123

FAIRBANKS MORSE

DIESEL ENGINES • ELECTRIC MACHINERY PUMPS • FAIRBANKS SCALES • RAILROAD EQUIPMENT • FARM EQUIPMENT • HOME APPLIANCES • HOUSEHOLD PRODUCTS • HEATING AND AIR CONDITIONING EQUIPMENT

F M

Motors

Manufacturing AND MARKETS

Orders Gain Shown by General Electric

Orders received by General Electric Company during the first two months this year totaled $64,000,000, an increase of 79 per cent over a year ago, according to Gerard Swope, president. Mr. Swope said that sales billed for the first two months totaled $45,000,000, a gain of 39 per cent over the same period last year.

Directors in releasing preliminary results of operations during 1936 declared a dividend of 40 cents a share for the first quarter, payable April 26, to stockholders of record March 19.

Sales billed during 1936 totaled $268,545,000, as against $208,733,000 in the preceding year, an increase of 29 per cent. Orders received totaled $296,748,000, against $217,362,000, a gain of 37 per cent.

Net income for the year was $43,947,000, after charges including provision of $300,000 for federal surtax on undistributed profits, equivalent to $1.52 a common share. This compares with $27,843,722, or 97 cents a share, in 1935. Mr. Swope pointed out that the increase in earnings was due, in part, to an increase in income from investments.

Cash and marketable securities at the end of the year amounted to $92,030,000, as against $93,710,000 at the close of 1935. Most of the marketable securities mature within five years.

Current assets totaled $178,625,000 and current liabilities were $29,841,000, as against $166,965,000 and $26,266,000, respectively.

Inventories, after reserves, totaled $60,049,000, against $49,951,000 a year ago. Inventories were 22 per cent of shipments billed in 1936, against 24 per cent, the year before, the same average for the preceding fifteen years.

Additions to plant during the year totaled $8,621,000 and the net value of plant at the end of the year, after deducting depreciation reserves, was $32,154,000, against $35,836,000 the year before. Total cost of plant was $182,654,000, against $182,873,000.

The company employed an average of 61,781, against 55,706 in the preceding year. Total earnings of employees amounted to $106,784,000, against $88,746,000.

•

I.E.S. Better Light Campaign Scheduled

New York City's 8,000,000 inhabitants will be the recipients of intensive educational and sales stimuli on the I.E.S. Better Light-Better Sight Lamp when retailers of that city join the Greist Manufacturing Company in a merchandising campaign scheduled for the entire month of March. This campaign was made public at the Greist I.E.S. "Seeing is Believing" Jubilee Dinner held at the Hotel Vanderbilt, New York, recently. Representatives of the retail, wholesale and utility fields attended.

Retailers will be provided with the most elaborate and extensive assemblage of merchandising aids ever offered in the portable lamp industry. Complete demonstration and display material as prepared by the I.E.S. Better Sight Lamp Makers in conjunction with the General Electric Company and Westinghouse Lamp Company will be supplemented by special campaign pieces prepared by the Greist Company.

•

General Cable Wage Rise

General Cable Company has increased wages of its 1,300 workers 4 cents an hour and installed an eight-hour day and 40-hour week in its Rome, N. Y., division plants.

New Sales Peak Seen in Laundering Units

Sales of home-laundering appliances during the year are expected to pass the 2,000,000-unit mark for the first time, acording to J. R. Bohnen, secretary of the American Washington Machine Manufacturers' Association. The total in use at the beginning of the year was 11,496,457 washers and 1,192,002 ironers, Mr. Bohnen said.

Household washers shipped in January totaled 121,754, as against 93,532 in December. Ironer shipments were 15,857, against 14,777.

It was stated by Mr. Bohnen that manufacturers will spend more than $5,000,000 in advertising this year. Equipment makers expect that purchases of washers and ironers will total $150,000,000 this year.

•

Kearney Holds Conference

Sales and engineering forces of the James R. Kearney Corporation recently met in St. Louis to co-ordinate plans for greater production of Kearney Products along with introduction of new equipment. The high spot in the ninth annual sales conference of the corporation was the formal banquet given at the Missouri Athletic Association of St. Louis.

•

Electric Companies Pledge $850,000 for Fair Bonds

The important part which electrical products play in almost every phase of modern life will be stressed in the electrical exhibits at the 1939 New York World's Fair, officials of the exposition have announced. According to present plans, in addition to the exhibits of electrical companies in the Electrical Industry Building at the fair, these products will also be seen

in conjunction with displays of other industries, such as food, shelter and transportation in which electricity plays an important part. Electrical companies have already pledged $850,000 to the industry's volunteer committee engaged in distributing the fair's 4 per cent debentures.

•

Sales Representatives Named

Electrical manufacturing companies have recently made the following assignments in their sales staffs:

Allen-Bradley Company is now being represented in the Kansas City territory by B. L. McCreary, with offices in the Mutual Building, 405 E. Thirteenth Street.

Roller-Smith Company announces the appointment of Paul Berry, 2528 N. W. 21st Street, Oklahoma City, Okla., as its agent for the state of Oklahoma.

Aiken Anchor Company announces the appointment of V. L. "Hap" Crawford as special representative.

Silvray Lighting, Inc., announces the appointment of R. J. Crump as resident sales engineer for the state of Ohio and surrounding trading area, with headquarters in Cincinnati.

Appointment of field representatives as the first step in consolidating General Electric's recent activities in the home-building field has been announced by Carl M. Snyder, manager of the G. E. Home Bureau. W. B. Aurandt has been named field representative in Boston and W. P. Quig in Philadelphia. A. J. Lee has been carrying on this activity in the New York area for more than a year.

N. B. Gilliland has been appointed to the sales engineering staff of the Detroit office of Lincoln Electric Company.

•

Plans Rural Lines

Montgomery County Rural Electric Association is planning the construction of 57 miles of rural electric lines in Toombs County, Ga.

•

Price of Copper Soars

Spot price for copper reached the highest level since March, 1930, when domestic metal sold at 16¼ this week. Other metal prices rose as demands increased. The advance was induced principally by the sharp rise and activity in the markets for raw materials, particularly those used in armaments, in all European centers.

New York Metal Prices

	March 3, 1937 Cents per Pound	March 9, 1937 Cents per Pound
Copper electrolytic	15.00*	16.25*
Lead Am. S. & R. price	7.00	7.25
Antimony	16.50	16.50
Nickel ingot	35.00	35.00
Zinc spot	7.35	7.85
Tin Straits	55.125	61.00
Aluminum, 99 per cent	20–21	20–21

* Delivered Connecticut Valley.

Field Reports on Business

Acceleration in business activity this spring is indicated in reports from the field to ELECTRICAL WORLD. *Demand for heavy electrical equipment is being maintained at an encouraging rate. Rehabilitation of manufacturing plants has resulted in increased sales volume of motors, switch and control apparatus. Lighting equipment sales continue at a brisk pace. Refrigerator sales are tending upward.*

NEW YORK

Continued sit-down strikes in automotive and other industries, which evidently are receiving passive encouragement from the Administration, have tended to somewhat gloom sentiment in this area. Resentment to President Roosevelt's attack on the Supreme Court at the dinner of the Democrats is still heard. The remarks of the President regarding the T.V.A. and other federal power dams, considered somewhat inaccurate, is believed by many to foreshadow continued attacks on private industry.

Electrical manufacturers continue to warn against delay by buyers of heavy equipment on the basis that a flood of orders may result in late shipments. Utility companies are going slow in putting their construction plans in operation. This is due to the uncertainty of the workings of utility legislation and when the Administration will cease its tactics of delay in the T.V.A. suits.

Retail outlets report continued good buying of household electrical equipment. The Easter season is expected to be the best in years. Construction of new homes is expected to stimulate electrical business.

NEW ENGLAND

No indications of slackening in sales of electrical equipment are apparent in this area and buying continues very strong in most lines of the electrical market. Heavy electrical machinery is receiving a good deal of attention by engineers; small motor orders are ahead of the volume reported for a corresponding period of last year by a wide margin, and the sales managers of motor departments of several nationally known manufacturers report no diminishing of interest in sight.

Switch and control apparatus sales are brisk; more than 10,000 house service switches were ordered recently from a Massachusetts manufacturer; an interesting order for multi-contact switches will be placed soon for use in a large New England office building now under construction. House meter sales are progressing, and a marked advance in volume over last year is now forecast in view of a large amount of new construction planned in this district.

Industrial electric heating applications are very active and some manufacturers are hard pressed to handle the project work offered each week. Factory lighting interest is strong. An addition to a well-known manufacturing plant will use 70—750-watt mercury-vapor combination lamps.

Air-conditioning apparatus is receiving a good deal of attention. A 115-apartment building in suburban Boston will be equipped with air-conditioning and oil-heating apparatus. A housing project consisting of 100 homes fully equipped with electric appointments has been started in the Boston area. Inquiries for electric commercial cooking equipment are gaining and installations are being considered by a number of restaurants. Refrigerator sales are strong in the Boston area; in southern Vermont a group of central stations report more than 50 per cent increase in last week's orders as compared with the corresponding week of last year.

CHICAGO

The spring acceleration in business activity became more pronounced last week as both consumer and capital goods markets quickened the tempo. Furthermore, as far as can be seen into the future, nothing can disturb the upward trend unless a major strike occurs in a focal point.

Electrical engineers from the various Stock Yard plants report greatly increased buying of electrical apparatus for rehabilitation and expansion of facilities to meet increased demands. Lighting equipment sales continue at a brisk pace; several large installations recently contracted for industrial and commercial jobs. An important factor noted in the majority of these installations is the substantial increase of illumination intensity employed, one specific job including 115 units to provide an average of 35 foot-candles. Orders for small motors are being received in good volume. Transformers are in demand as well as panel boards, conduit, fittings and wiring devices. Contractors report increased activity in rewiring and outlet work.

PACIFIC COAST

Business optimism seems definitely restored by national as well as local labor settlements, and architects and engineers report having received orders to release various jobs, which had been partially worked out, but withheld during early-year pessimism. Buying continues heavy through stimulus of advancing steel and copper material prices. Much heavy machinery buying is reported, the Seattle Board of Public Works having recently ordered $160,000 of Westinghouse transformers, $140,000 of General Electric condensers and $160,000 of Pacific Electric circuit breakers, all for its Skagit 120-mile line, and are now in the market for steel transmission towers estimated at $700,000 and a $30,000 control switchboard. The Denver mint has contracted for a $250,000 special electrical installation. Los Angeles is planning a $1,000,000 livestock fair building, and other projected public structures for Southern California area include a $500,000 veteran's administration building in Los Angeles, a $400,000 addition to the San Bernardino Courthouse and a forest service headquarters building. The largest recent building award is $1,589,851 for engineering and repair docks at the Sacramento army air base.

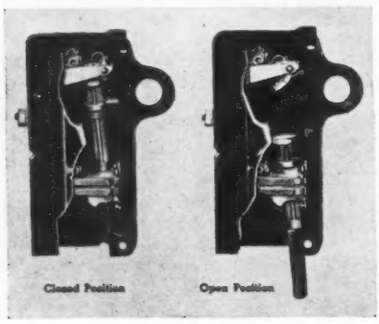
San Francisco is planning two new streets through the heart of the downtown shopping district, necessitated by the Bay Bridge traffic, and costing $3,000,000 plus the cost of rebuilding adjacent structures.

San Francisco fixture firms are figuring on $20,000 lighting units for the furniture exchange. March and April will apparently surpass last year's refrigerator sales.

New EQUIPMENT AVAILABLE

Disconnecting Switch

Instant indication of open or closed position, complete weather protection of all parts at all times, convenient operation and long-



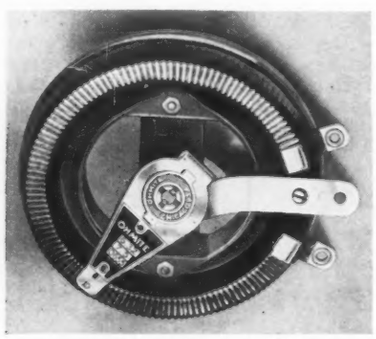
Type PVD; ratings, 5 and 7.5 kv., 100 and 200 amp. **Line Material Co.**, South Milwaukee, Wis.

lasting efficiency are claimed features of this new disconnecting switch. Switch blade is attached to the door in the same manner as the fuse tubes on the company's PVD fuse cutouts and is pulled free of the contact clips when the door is pulled open. When the switch is to be kept open the blade is lowered into the open position and locked and the door closed. To reclose the circuit the door is reopened, the blade raised from open to closed position and locked and the door reclosed. Bakelite indicator protruding from base of the housing indicates the open position.

•

Rheostat

A new wire-wound rheostat is said to be capable of controlling many types of loads which were formerly believed to require the button-contact type of rheostat. The resistance wire is wound over a horseshoe shaped porcelain core mounted on a porcelain base. The entire unit, with the exception of the contact surface, is then covered with vitreous enamel and fired at a high temperature. When it cools the vitreous enamel becomes glassy hard, not only holding each turn of wire rigidly in place, but also fusing the entire assembly into one unit, with nothing in it to smoke or char.



Model "U"; rated at 1 kw. **Ohmite Manufacturing Co.**, Chicago, Ill.

•

Circuit Breakers

Equipment and circuit protection in hazardous locations where inflammable gases and explosive dusts prevail is said to be provided by this special housing developed for the company's new "Re-Cirk-It" breakers. Magnetic and non-thermal circuit breaker is mounted in the upper section of the two-part metal casting. The bushed handle opens and closes the circuit independently of the tripping action of the in-

Re-Cirk-It; in capacities from 50 ma. to 35 amp., one, two or three poles; other mountings and casings available; instantaneous and time delay types. **Heinemann Electric Co.**, Trenton, N. J.

closed breaker, it is claimed, where normal conditions exist. Tapped hubs for 1-in. threaded conduit are provided at the top of the casing.

•

Watt-Hour Meter Protectors

Available for outdoor or indoor service. **Westinghouse Electric & Manufacturing Co.**, East Pittsburgh, Pa.

Recently announced watt-hour meter protectors are designed to protect meters against lightning surge voltages. They consist of an assembly of porous block elements and series gaps; the outdoor type is inclosed in a moisture-proof porcelain casing. These protectors can also be used to protect the secondaries of transformers and as two-pole arresters for the protection of single-phase circuits, it is said.

Rotating-Cam Switches

A line of rotating cam switches, designed especially for built-in control applications and adaptable to a variety of electrical fun-

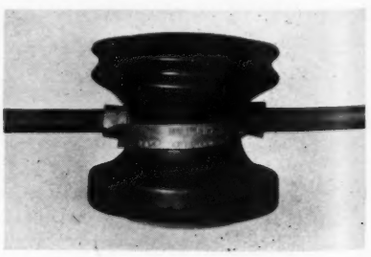
G. E. CR3300; two sizes, one rated 15 amp. continuous, other rated 25 amp. continuous, both for 600 volts or less, a.c. **General Electric Co.**, Schenectady, N. Y.

tions and machine requirements, has recently been placed on the market. For non-built-in applications, however, the devices are available as standard switches without the flanges used for flush-mounting on machines. Line is manufactured in a number of mechanical and electrical modifications, making it universally adaptable, it is said, to applications varying from machine-tool motor control to steel-mill master switching.

•

Insulator Tie Clips

Use of these band-shaped clips saves more than half the time of attaching secondary wires to insulator spools and saves about 18 in. of tie wire, according to the manufacturer. In addition they are said to leave more room for anchoring service take-offs. Of copper or aluminum, they are provided with two hooks which are slipped over opposite sides of the secondary conductor



Tyclyps; two sizes—for secondary spool on pole or for spool on house bracket. **W. N. Matthews Corp.**, St. Louis, Mo.

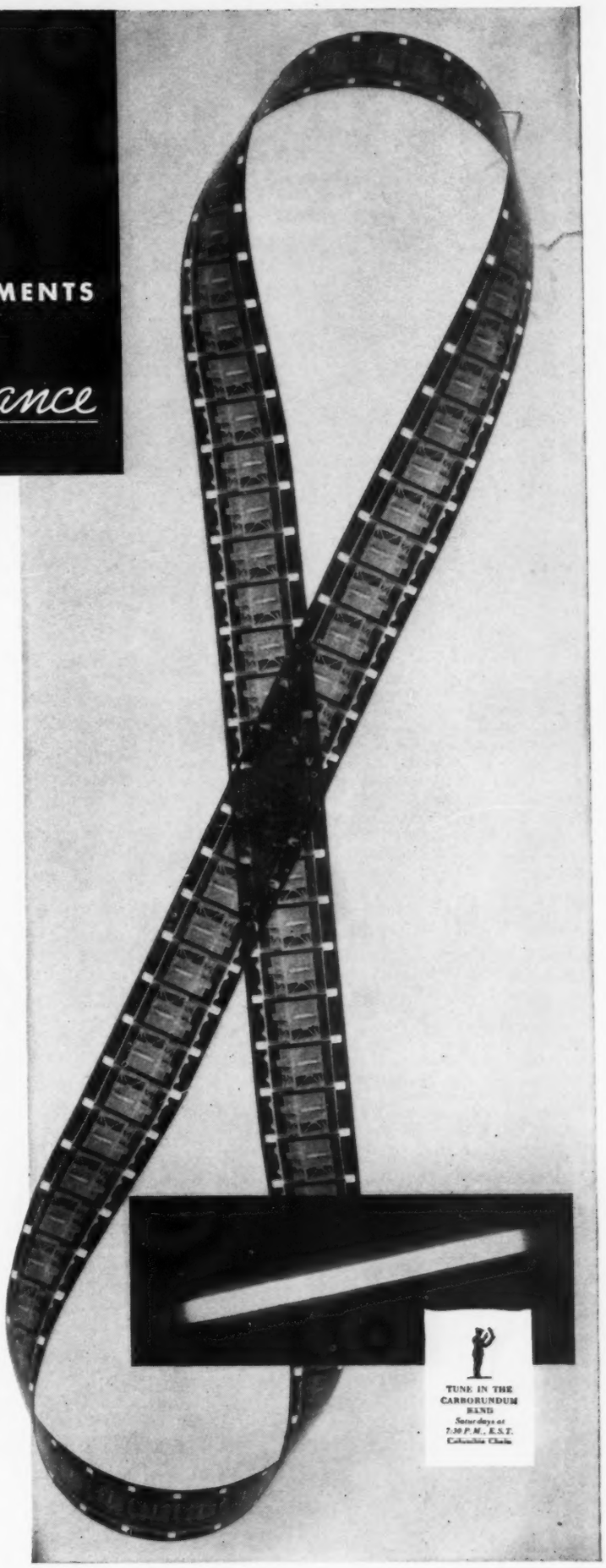
Globar

REG. U. S. PAT. OFF.

BRAND

NON-METALLIC HEATING ELEMENTS

assure continuous performance



CONTINUOUS SERVICE is tremendously important when a furnace operates on a production schedule. But with ordinary electric heating elements the furnace must be shut down to make the replacements which are necessary from time to time.

Not so with Globar Brand Non-Metallic Electric Heating Elements. They can be replaced, one unit at a time, without interrupting service. Performance is continuous. It is not necessary to cut the furnace out of service for perhaps days while it cools, while the element is replaced, and while it comes up to temperature again.

Loss of production for even a day may be disastrous and any high temperature electric furnace which must be shut down for element replacement is definitely a major production hazard. Element replacement should be simple, rapid and inexpensive. So when you buy a high temperature electric furnace make sure you specify long-lived, easily replaceable Globar Brand Non-Metallic Heating Elements.

Our engineers will be glad to offer you the benefit of their experience when you are figuring on a new furnace installation. There is no obligation, of course.

THE CARBORUNDUM COMPANY

REG. U. S. PAT. OFF.

Globar Division, Niagara Falls, N. Y.

District Sales Branches: Boston, Chicago, Cleveland, Detroit, Philadelphia, Pittsburgh

(Carborundum and Globar are registered trade-marks of The Carborundum Company)

after being put around the insulator spool. These hooks may then be rolled tightly around the conductor by the lineman with his pliers.

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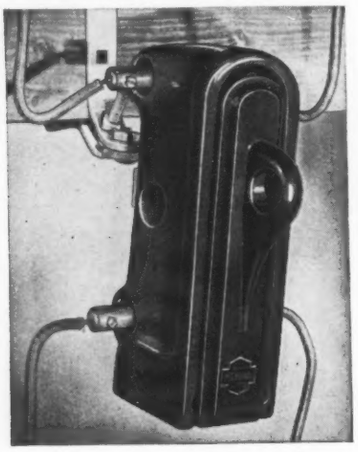
Street Lighting Cutout

A cutout for automatically isolating loop circuits in series street lighting systems when an open occurs in the loop is a recent development. Cutout is essentially a



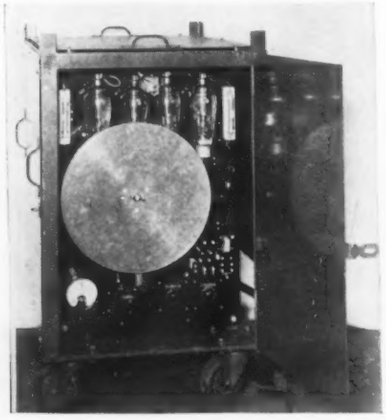
Tripomatic sectionalizing cutout. **James R. Kearney Corp.**, St. Louis, Mo.

two-bladed disconnecting, or loop, switch which operates in sequence with an auxiliary switch. A spark gap is in series with a fuse link and the two are connected across the loop circuit. When an open occurs in the loop the spark gap breaks down under the open circuit voltage of the constant current transformer, the fuse link blows and the loop switch opens; simultaneously the auxiliary switch closes. Thus the main circuit continues in operation and the faulted loop circuit is isolated.

•

Seam Welder Control

Use of ignitron tubes in this seam welder control is said to permit a design utilizing no voltages higher than line voltages and eliminating need of power contactors and transformers. Control times power impulses in terms of definite number of power cycles to wheel-type electrode resistance-welding machine. Among its features is an inductive timer, consisting of a synchronous-driven disk rotating once a second and containing 120 holes, each corresponding to a half-cycle of welding current; steel pins are plugged into holes according to timing desired. Control is said to be specially suitable for welding of heavy gage steels and special metal alloys requiring accurate timing and often heavy current.



Seam welder control. **Westinghouse Electric & Manufacturing Co.**, East Pittsburgh, Pa.

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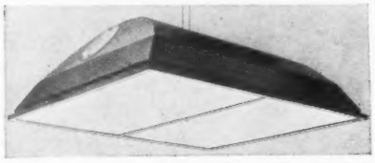
Reflector

A new reflector is announced as an exceptionally large-size diffusing fixture of unusually low and uniform surface brightness to cover large areas and to minimize the



"Skylight" reflector. **Benjamin Electric Manufacturing Co.**, Des Plaines, Ill.

intensity of specular reflections from shiny surfaces by providing an artificial luminous ceiling for local lighting applications. Fixture consists of a 28x36-in. trough-shaped, porcelain-enameled steel reflector fitted with two medium base sockets for lamps from 15 to 200 watts in size. Reflector opening is covered by two sections of flat diffusing glass joined and removable at the middle.

•

Ground Wire Bracket

For supporting suspension clamps for overhead ground wires on wood pole lines a new ground wire bracket is said to prevent the loss of considerable pole height. The

Ground wire bracket; has ultimate strength of approximately 8,000 lb. for vertical loads, 5,000 lb. for horizontal loads. **Ohio Brass Co.**, Mansfield, Ohio.

new fitting allows the ground wire to be attached to the pole itself, eliminating the need for the pole extension commonly used. In combination with the suspension clamp commonly used with ground wires, the device sacrifices only 3¾ in. of the pole height, according to the manufacturers. It is made of malleable iron, hot dip galvanized.

•

Screw Anchor

This new screw anchor can be installed without a wrench, says the manufacturer. Its large triple eye rod permits use of a bar for screwing the anchor into the ground and admits one, two or three strands for guying. Hub of the anchor is small to give maximum area in semi-disturbed earth and the thin malleable blade is pitched for easy installation without danger of the anchor backing up after installation. A flange on the cutting edge reduces friction in screwing down. Rod is fastened securely to the anchor, but can be screwed out if it is desired to retrieve the anchor.

No-Wrench thimbleye screw anchor. **A. B. Chance Co.**, Centralia, Mo.

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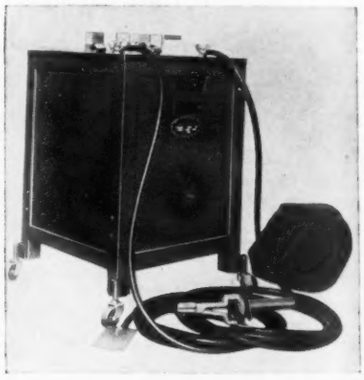
Arc Welders

Portable, transformer-type arc welders have recently been announced that are said to be lighter in weight because they have



"Standard Arc"; four models, capacities from 130 to 300 amp. **Miller Electric Mfg. Co.**, Appleton, Wis.

a wood cabinet and fewer amperage controls than the regular welders. They are equipped with rotary knife switch control, with the amperage marked for each welding step, and do not have reactance control or sheet metal attachment. It is claimed that they may be safely used to weld on grounded surfaces, since they are not of the auto-transformer type.

•

CO_2 Indicator

Ranarex; to operate either on lighting circuits or on standard 6-volt automobile batteries. **Permutit Co.**, New York, N. Y.

Portable instruments are available for determining the CO_2 content of boiler and furnace flue gases and also for determining the air-fuel ratio in the exhaust gases of internal combustion engines. Instrument makes this determination by a mechanical principle based on the fact that the specific weight of exhaust or flue gases varies with changes in air-fuel ratio or CO_2 content, it is said.

•

Correction

The "Staput" cable protector, announced on page 104 of ELECTRICAL WORLD for February 27, is approximately 9 in. long, rather than 6 in., as printed. It is a product of Wm. B. Berry Co., Boston, Mass.

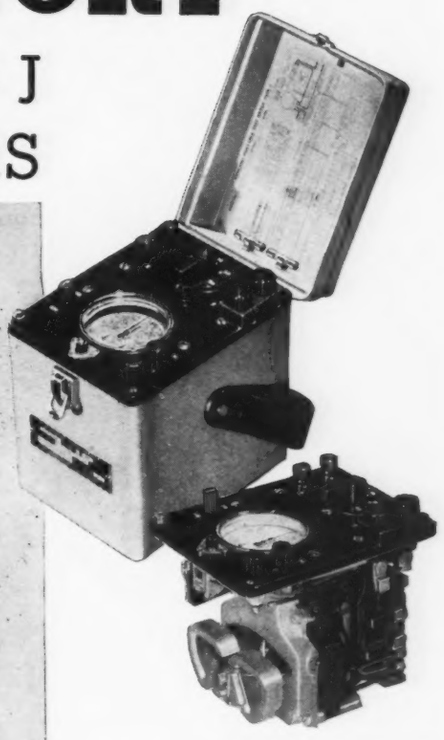
THE *INSIDE* STORY

OF THE SANGAMO TYPE J PORTABLE TEST METERS

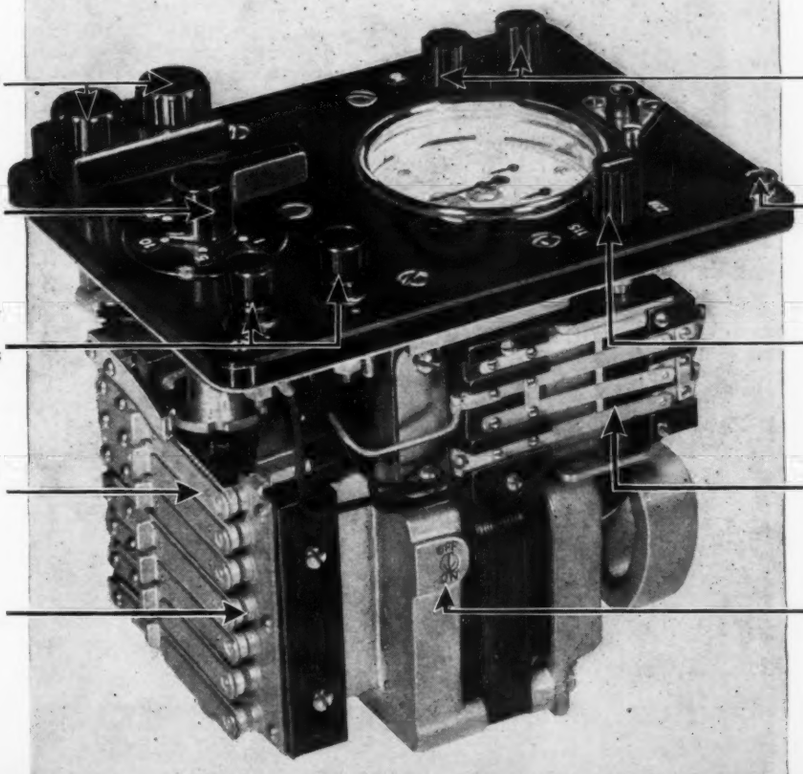
From the *outside*, the Sangamo Type J Portable Test Meter is modern and neat appearing with aluminum case and cover.

The *inside* story is shown in the view below.

- Silver contact buttons, similar to those pioneered in other Sangamo products, provide positive contacts on the current and potential switches.
- All moving parts operate on jewel bearings; in addition, the jewel in the lower bearing is spring-supported.
- A positive-acting reset mechanism assures the accurate returning of all register pointers to zero.



Rigid construction is accomplished by securing to the sturdy aluminum grids the single unit driving element, permanent magnets, adjustments and other assemblies.



These instruments are furnished in two types: Type J-5 has five current ranges for 1, 5, 10, 25 and 50 amperes. Type J-3 has three, for 1, 5 and 25 amperes.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

VULCOID Provides
MOISTURE RESISTANCE
Plus Economy

Among Continental-Diamond electrical insulating materials VULCOID is steadily gaining in electrical applications. It is a *non-hygroscopic* material that is tough, strong and readily machined. It is furnished in standard sheet, rod and tube forms or in parts fabricated to specification.

VULCOID may be used by you to effect production economies or improve product performance. Let us send you samples and complete data.

CONTINENTAL-DIAMOND FIBRE CO
NEWARK, DELAWARE

Represented in Canada by
DIAMOND STATE FIBRE CO. OF CANADA LIMITED
Toronto — Montreal

Municipal Plants

HUNTINGTON, IND.—A receiver for the unofficial electric utility (ELECTRICAL WORLD, February 13, page 134) is demanded in suits filed in Circuit Court by the National Mill Supply Company and the Protective Electric Supply Company, both of Fort Wayne. The former company claims an unpaid bill of $4,600 for equipment provided the utility in 1935 and the latter asserts its bill of $5,100 is unpaid.

FOREST CITY, IOWA—State Supreme Court has granted the City Council an order temporarily staying the injunction obtained by the Interstate Power Company in the Winnebago County District Court that prohibited the city from receiving bids on a municipal light plant. The order permits the city to hold a public hearing on plans for the plant and to receive bids and make a contract for the construction of the plant. It stays the effect of the injunction until the case is finally decided at the April term of the Supreme Court.

GLASGOW, KY.—City Attorney Cecil Wilson has announced that he will take the city bond issue case to the Court of Appeals. Judge Will H. Fulton recently ruled that the city could not issue bonds for erection of a municipal power plant because a site had not been selected and a survey made prior to the election.

CUMBERLAND, MD.—Authorizing and directing the Mayor and City Council to submit the question of establishment of a $2,000,000 electric power plant to the voters at the next municipal election, a bill has been introduced in the Maryland General Assembly, now in session. The measure provides that if the voters approve the plan the city borrow the money with which to construct and equip the plant.

MINNEAPOLIS, MINN.—Ignoring a motion to approve a bill permitting the city to buy or build a light and power plant, the committee on cities of the first class of the state House of Representatives has ordered a public hearing on the measure after being told it would permit Minneapolis to take over St. Paul utilities. The bill was attacked by Charles Murphy, attorney for the Northern States Power Company, who declared it has state-wide application because of a provision exempting any city-owned utility set-up from county and state taxation. The provision permitting purchase and operation of utilities within a 50-mile radius of the city would let Minneapolis go anywhere into Ramsey County anr operate exempt from Ramsey County taxes, Mr. Murphy said. John G. Priebe, Minneapolis attorney, who drew the bill for Mayor Thomas Latimer, said Minneapolis would have no objection to selling power to St. Paul if St. Paul wanted to buy it.

ELECTRA, TEX.—P.W.A. has approved a loan of $122,000 and a grant of $99,818 for an electric power and distribution system estimated to cost $221,818. The project consists of a municipally owned and operated Diesel electric power plant and distribution system. The generating plant will consist of a fireproof building housing generators, switchboard and auxiliary equipment. The distribution system will serve domestic and commercial customers and municipal street lighting.

PORTSMOUTH, VA.—Plans to build a municipal electric light and power plant have been approved by City Council. The Mayor has authorized the filing of an application with the P.W.A. for a grant to take care of 45 percent of the cost, which will be less than $2,000,000. Action of the Council was taken after L. T. Klauder, Philadelphia consulting engineer, had ren-

In the "junior" field too—
LINCOLN leads by a mile

HERE'S Why

75 AMP. LINCOLN "JUNIOR" $200.00

100 AMP. LINCOLN "JUNIOR" $225.00

150 AMP. LINCOLN "JUNIOR" $250.00

LINCOLN QUALITY *AT THESE* LOW PRICES!

Think of it! A high grade Lincoln welder for as little as $200.00! Is it any wonder that these "Junior" welders are in such demand? Shops that are starting to arc weld and shops that have been arc welding for years—welding users, small and large, by the hundreds—are hooking up these powerful little motor generator welders to the line and are discovering new short-cuts to profits.

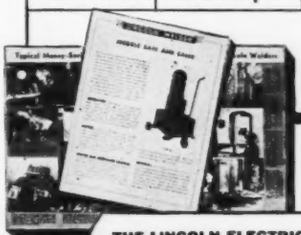
These Lincoln "Juniors" embody the same high quality workmanship and materials as the larger Lincoln welders. ★ Vertical design makes them compact—they occupy a floor space less than 2 ft. square. ★ They have Dual Arc Control with Plus Zone Range. ★ Heavy duty motor has long-lived ball bearings. ★ Commutator and brush wear is minimum because peripheral speed is low.

The coupon will bring you all the facts about these four-star actors—the most popular welding performers in the low-price field.

TYPE	N. E. M. A. RATING	RANGE IN AMPS.	PRICE* (F. O. B. CLEVELAND, O., *Freight allowed and prepaid*)
SA-75	75 amps.	20-100	$200.00
SA-100	100 amps.	30-125	$225.00
SA-150	150 amps.	45-200	$250.00

*Portable parts are $8.00 additional.

PRICES MAY SOON RISE!



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THE LINCOLN ELECTRIC COMPANY, Dept. U -360, Cleveland, Ohio

Send details concerning the ☐ SA-75 ☐ SA-100 ☐ SA-150 (check which).

To be used for _____

Name _____ Position _____

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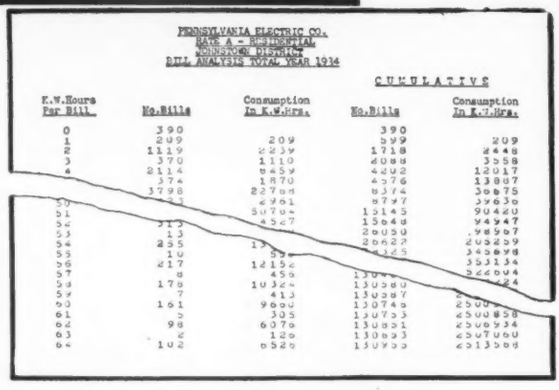
THE ONE-STEP METHOD

OF BILL ANALYSIS

The kw.-hrs. billed are entered on adding machine keyboard. A tape is prepared of all items and a consumption total accumulated which serves as a control. At the same time—by this single operation — the bill count for each kw.-hr. step is made by electrically controlled accumulating registers.

It is a simple matter to determine revenue effect of any proposed rate.



PENNSYLVANIA ELECTRIC CO.
RATE A - RESIDENTIAL
JOHNSTOWN DISTRICT
BILL ANALYSIS TOTAL YEAR 1934

K.W.Hours Per Bill	No.Bills	Consumption In K.W.Hrs.	CUMULATIVE No.Bills	CUMULATIVE Consumption In K.W.Hrs.
0	390		390	
1	209	209	599	209
2	1119	2239	1718	2448
3	370	1110	2088	3558
4	2114	8459	4202	12017
	374	1870	4576	13887
	3798	22788	8374	36675
		4961	8797	41636
50		50700	15145	90420
51		45567	15644	96987
52	313		15957	
53	13		15970	
54	235	12	16205	
55	10	55		
56	417	12156		
57	8	456		
58	178	10324		
59	7	413		
60	161	9660		
61	5	305		
62	98	6076		
63	2	126		
64	102	6528		

HERE'S *the Practical answer to*

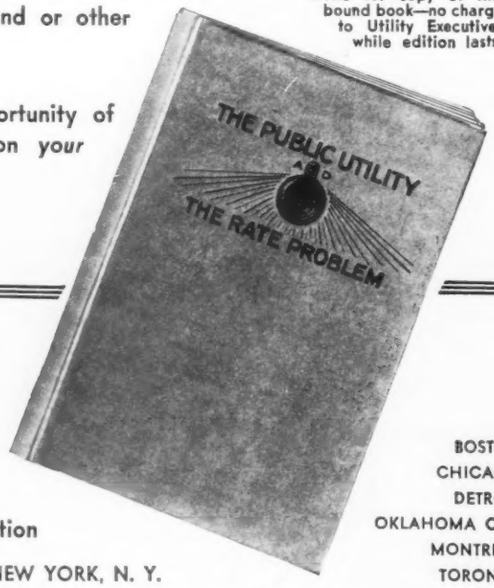
BILL ANALYSIS PROBLEMS

Complete accurate consumption analyses, current and special, can be made now at nominal cost without interrupting your normal routine.

With the R. & S. Bill Frequency Analyzer, the former complicated operation is reduced to a single step. Scientific bill analyses can be rapidly and correctly made at a saving of 50% over hand or other machine methods.

May we have the opportunity of proving such savings on *your* work?

Write for copy of this bound book—no charge to Utility Executives while edition lasts.



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dered a comprehensive report of his survey with respect to the advisability of municipal electric light and power service. The city is contesting the right of the Virginia Electric & Power Company to use the streets for poles and transmission lines.

YAKIMA, WASH.—A municipal power project has been defeated by a vote of more than six to one. Balloting was 4,713 to 723 against a proposal to put the city into the electric business by purchasing the distribution system of the Pacific Power & Light Company.

DURBIN, W. VA.—The town has asked the Public Service Commission for permission to sell its electric plant and distribution lines to the Monongahela West Penn Public Service Company.

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Recent Rate Changes

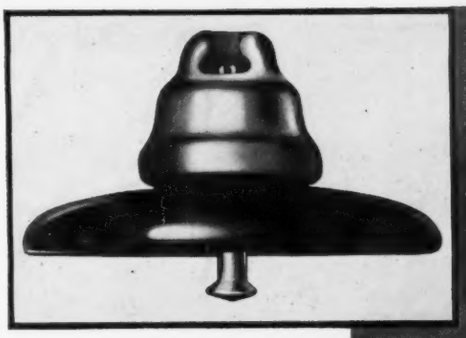
SAN DIEGO CONSOLIDATED GAS & ELECTRIC COMPANY has announced rate reductions amounting to an estimated $422,897 annually effective March 15, according to an announcement by Walter L. Ware, president of the California Railroad Commission. Reductions will be divided $311,214 to electrical consumers and $111,683 to gas users. Domestic consumers annual charges or electricity ill be reduced by an estimated $119,632. Commercial lighting customers will get $87,635 reductions, industrial users $94,291 annually and street lighting consumers $9,656.

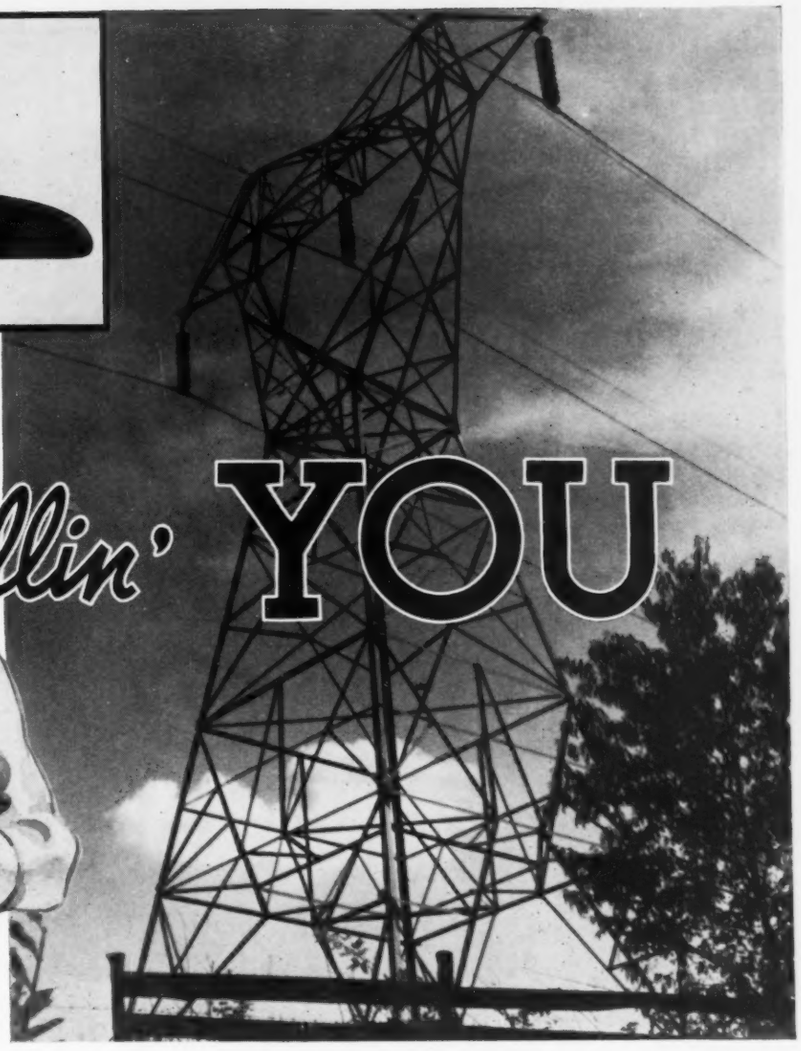
DUQUESNE LIGHT COMPANY'S reduced schedule of rates is still unsatisfactory to the Pennsylvania Public Service Commission. The commission announced after exhaustive analysis that the proposed rate cuts for Allegheny County would give small domestic consumers no benefits unless they used an unusual amount of energy and rejected the offer in its present form. The company was asked to rearrange the scale of cuts so that this type of consumer would benefit most. The commission also ordered a study made of the light company's municipal street lighting charges. The utility company had estimated that this yearly reduction proposed in the second of its offers would benefit small commercial consumers by $309,300, residential consumers by $236,000 and large commercial users by $83,700.

WEST PENN POWER COMPANY has offered a $973,000 annual rate reduction to its customers in sixteen counties. After a series of informal conferences the company filed new schedules with the Public Service Commission, affecting most classes of service. Chief beneficiaries of the rate slashes, scheduled to become effective in March and June, will be commercial and small industrial customers whose annual savings were estimated at $533,000. Other affected customers and total estimated rate reductions include: Residential, $350,000; schools and churches, $30,000; rural customers, $40,000; municipalities, (street lighting), $20,000.

NEW YORK STATE ELECTRIC & GAS CORPORATION has filed reduced residential rates with the Public Service Commission which have become effective in the Plattsburg district of the company. The commission permitted the lower rates to go into effect as of February 13, 1937. Savings of $13,180 a year will be realized.

BELTON LIGHT & POWER COMPANY, serving the towns of Belton and Williamston, S. C., has been ordered by the Public Service Commission to put into force a 10 per cent reduction in its electric rates—residential, commercial and small power.





I'M *tellin'* YOU

I'm the guy that puts these insulators up. I've been doin' it for a good many years — and I still can't tell a good one by lookin' at it. The only way I can tell is by puttin' 'em up and takin' 'em down. That's how I know these Porcelain Products insulators are O. K. I've put a lot of 'em up — but I haven't taken any down yet.

PORCELAIN PRODUCTS, INC.

PARKERSBURG, WEST VIRGINIA, U. S. A.

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Light on the Job
WHERE LIGHT IS NEEDED

NOW THE MODERN ENGINEERING PRACTICE —LOCALIZE LIGHT WITH FOSTORIA *flexible* LOCALITE

Throughout industry, a great potential exists in the need for modern localized high intensity lighting. The development of the Fostoria Localite now provides the needed equipment improvements to serve this vast market . . . Engineered to individual requirements, the Fostoria Localite automatically adjustable supporting arm incorporates extreme flexibility with adequate rigidity to withstand shock and vibration. Reflectors of modern designs including the new Uni-focal, illustrated above, are properly styled for a wide variety of purposes . . . Illuminating Engineers of many power companies are now recommending Fostoria installations wherever localized high intensity lighting is needed. Complete information will be sent to you promptly on request.

Complete Brochure of Fostoria equipment will be mailed on request.

THE FOSTORIA PRESSED STEEL CORP.
FOSTORIA, OHIO

LOCALITE FOR BETTER SIGHT

6 Important reasons to recommend installation of FOSTORIA LOCALITES

- INCREASES PRODUCTION
- LOWERS PRODUCTION COSTS
- DECREASES PRODUCTION SPOILAGE
- INSURES SAFETY OF WORKMEN
- IMPROVES PRODUCT QUALITY THRU BETTER WORKMANSHIP
- SAVES MUCH MORE THAN THE INSTALLATION COSTS

Letters to the Editor

[*Continued from page 43*]

sively bright, as 40 or possibly 50 ft.-candles is the limit for comfort for indirect lighting.

Fortunately there is nothing to be alarmed at in the lighting of the Washington schools. The illumination that is actually received is conservative and about in line with that secured in other modern schools throughout the country.

From the illustration shown in Knudstrup's article it would seem that the schoolroom might be economically turned upside down as the illumination on the ceiling appears to be excellent and that on the desks quite meager. With six 500-watt lamps in a standard classroom 24x30 ft. there would be 80 generated lumens per square foot of floor space, which would produce 80 ft.-candles with a 100 per cent utilization instead of the 38 ft.-candles claimed and 18.5 ft.-candles actual. There is more than a suspicion that this Washington school is distinctly not a leader in converting generated lumens into foot-candles. I have never considered brute force good engineering.

DAVIS H. TUCK,
Electrical Engineer
Holophane Co., New York.

Replying to your letter of January 28, 1937, in reference to the letter sent to you by Davis H. Tuck of the Holophane Company, dated January 22, 1937, I would like to make the following comments:

Every foot-candle value published in my article "Washington Schools Lead in Lighting" has been checked by a competent engineer. A Weston Electrical Instrument Corporation sightmeter, model No. 703, and a Weston photronic foot-candle meter, model No. 614, were used. The foot-candle readings on the meters were taken independently. Before the readings were taken each meter was calibratd by a reliable laboratory. In each and every case all foot-candle values published in the foregoing mentioned article in the ELECTRICAL WORLD were found to be correct.

AKSEL KNUDSTRUP,
Lighting Engineer
Potomac Electric Power Co.,
Washington, D. C.

•

Every Executive Should Read It

To the Editor of ELECTRICAL WORLD:

The January 16, 1937, issue of ELECTRICAL WORLD carried an article which was of special interest to us. It is entitled "Human Engineering — Salvation of Industry," by Laurin E. Hinman.

The author evinces deep insight and a thorough understanding of one of the basic problems of all industry and the ELECTRICAL WORLD shows itself to be right up to the minute in publishing this article.

Every executive ought to read that article. It would be of great value to him to do so and it would make him realize how much benefit he misses by failing to read every issue of the ELECTRICAL WORLD.

FERRIS M. WAKELEY,
Director,
Institute of Human Engineering.

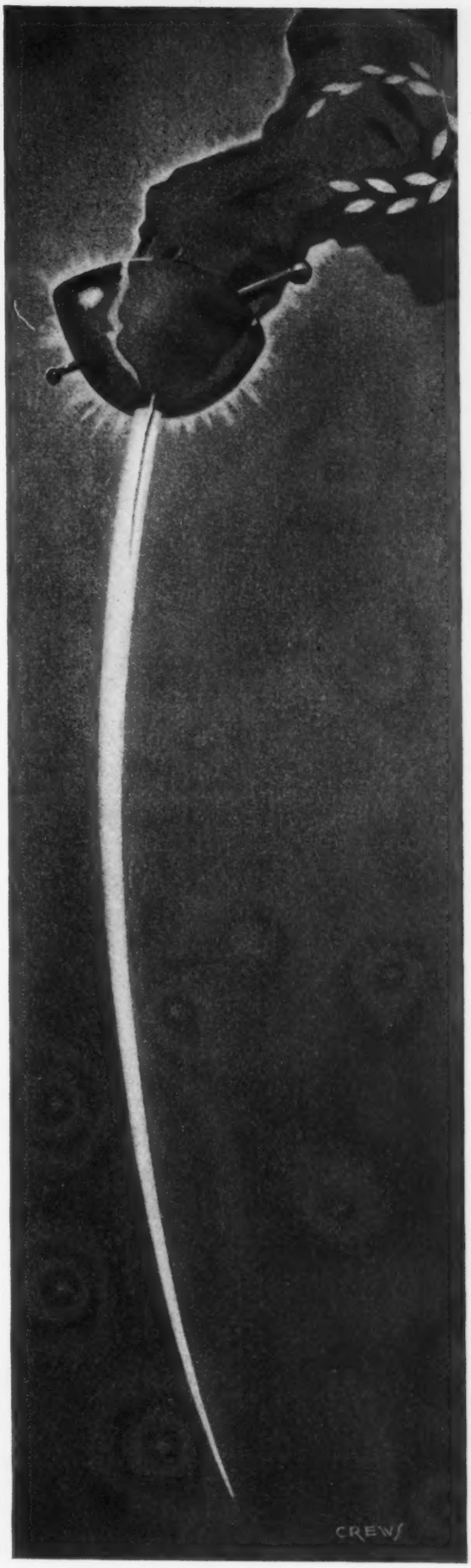
THE *truth* ABOUT MICA

The FLEXIBILITY of Macallen Mica makes it available—in cold-formed or hot-molded parts—for an infinite variety of insulation purposes.

Macallen provides Mica in Sheets, Plates, Tubing, Paper, Cloth, Tape—to meet every requirement. Macallen engineers invite you to consult them on any problem involving the use of Mica.

Mica parts produced by Macallen are uniform in composition and mechanical strength; have high thermal and electrical resistance; are accurate to precision measurements.

Mica is not a substitute—there is no substitute for Mica as an insulating material. Little affected by heat, moisture, or oil.



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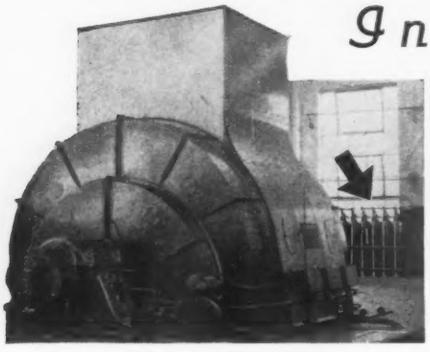
SERIES IN WHICH SOME OF THE
GREAT PUBLIC UTILITIES TELL HOW LUX MEANS "UNINTERRUPTED SERVICE"

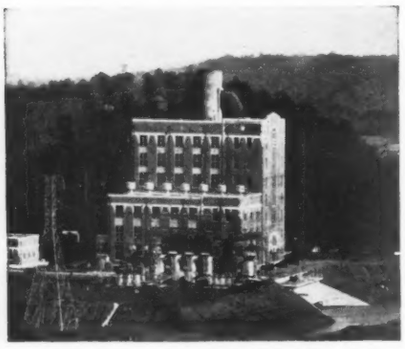


In Alabama

POWER STAYS ON THE LINE

(Above)—Condenser at Anniston Primary Sub-Station. Note LUX cylinders in the rear.

(At top)—Mitchell Dam Development of Alabama Power Company.



The Gorgas No. 2 Steam Plant. A reserve unit called on for 80,000 H.P. in case of low water flow in hydro plants.

IN THE development of the Southeastern States the electric power companies have played an important part. They have been largely instrumental in bringing about a proper balance between the vast agricultural area and industry which it serves. The Alabama Power Company was organized in 1911 and today serves 10,000 circuit miles twenty-four hours a day.

The excellent safety practices of the Alabama Power Company have resulted in surprisingly low fire losses all around. To keep down fire damage, a large number of LUX portables as well as automatic systems stand guard over the Company's extensive investment in Primary Sub-Stations, Generating Stations, Switch Board Rooms and Garages.

Recently, on one of their synchronous condensers, a bolt holding the clamp for leads from the collector rings to the field coils broke. The clamp was thrown into the stator windings, short-circuiting some of the coils. The resultant operation of the machine differential relays, caused the LUX system to operate, flooding the entire machine with LUX gas, thus confining the damage to the affected coils and preventing serious fire damage or possible total loss of the machine.

A new booklet supplementing "Smothering Fire in Power Plants" lists the hundreds of other great Public Utility projects which are LUX-protected. Write for your copy.

Employing the dry harmless gas—carbon dioxide—LUX systems swing into action at the first flash of heat and three seconds later fire cannot exist. Yet the cost of LUX systems is often less than ½ of 1% of the value of protected equipment.

Let our engineering staff survey your requirements and submit recommendations.

Walter Kidde & Company, Inc.
30 West St., Bloomfield, N. J.

FOR ALL ELECTRICAL AND FLAMMABLE LIQUID FIRES

Sales Opportunities

LORAIN, OHIO—Ohio Public Service Company, Cleveland, Ohio, has plans maturing for expansion and improvements in steam-electric generating station at Lorain, including installation of new 50,000-kw. turbo-generator unit and auxiliary equipment, high-pressure boilers, stokers and other equipment for steam division. Extensions will be made in transmission lines, including lines for increased service connecting with station at Warren, Ohio. Power substation and switching station facilities will be expanded in both districts noted. Entire project will cost about $5,000,000.

MEMPHIS, TENN.—City Light and Water Commission receives bids until March 18 for power substation in South Gate district, for high-tension service from lines of TVA, with switching, control and distribution facilities. Cost close to $300,000.

KINGFISHER, OKLA.—Consumers Electric Company, recently organized, has plans maturing for primary and secondary lines for rural electrification in parts of Kingfisher, Logan, Blaine, Canadian and neighboring counties, totaling close to 330 miles, with outdoor power substation and service facilities. Initial fund of $300,000 has been secured through Federal aid.

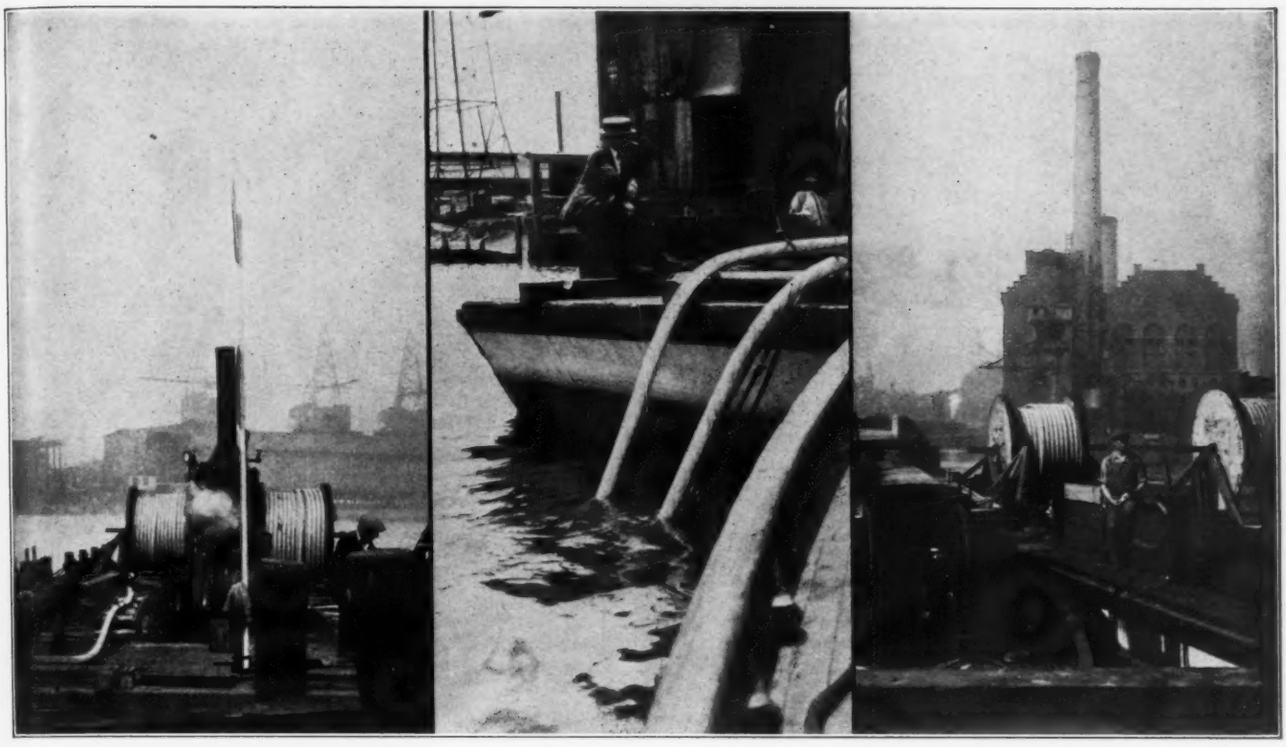
RIDGEFIELD PARK, N. J.—Public Service Electric & Gas Company, Newark, N. J., has begun surveys for new transmission line from Marion Station, Jersey City, N. J., to power substation at Ridgefield Park. Line will be strung on steel towers and will cross 11 tidal waterways. Application has been made for permission.

WASHINGTON, D. C.—General Purchasing Officer, Panama Canal, Washington, receives bids until March 19 for four distribution type transformers, quantity of steel conduit, copper cable, rubber-insulated cable, apparatus type cable, terminal tubes for electric cables, watthour meters, one motor-driven air compressor and other supplies (Schedule 3229).

MIDDLETOWN, OHIO—Cincinnati Gas & Electric Company, Cincinnati, Ohio, has approved plans for new indoor type power substation on Canal Street, Middletown, and will begin work soon.

PHOENIX, ARIZ.—Central Arizona Light & Power Company plans addition to steam-electric generating plant near western city limits, with installation of new generator unit and auxiliary equipment for increased capacity, including improvements in present station, estimated to cost about $350,000. New power substation for local distribution will be built in northwestern part of city, to cost close to $40,000, with transformers, switchgear and accessory equipment. Company has also authorized rebuilding of present 44,000-volt transmission lines extending to Avondale and Buckeye, to operate at 66,000 volts, and will construct new high-tension substation between last two noted places, at point known as Perryville, with 3000-kw. rating. Extensions and improvements will be made in distributing lines at Phoenix and other points, including new lines for rural electrification, to cost approximately $100,000. Work will be carried out as part of 1937 expansion and improvement program.

OCILLA, GA.—Irwin County Rural Electric Association, Ocilla, J. B. Berry, president, receives bids until March 17 for rural electrification system in parts of Irwin, Berrien, Ben Hill and Coffee Counties, comprising 17 miles of three phase 6900/12,000-volt transmission lines, 138 miles of 6900-volt primary lines, and about 30 miles



Off to Davy Jones' Locker!

It makes no difference to Simplex Varnished Cambric Cables whether they are to operate in Davy Jones' Locker or whether they become confirmed landlubbers. They will do their job with equal facility at the bottom of the ocean, at the ceiling level of some industrial or out in the open at some transformer station.

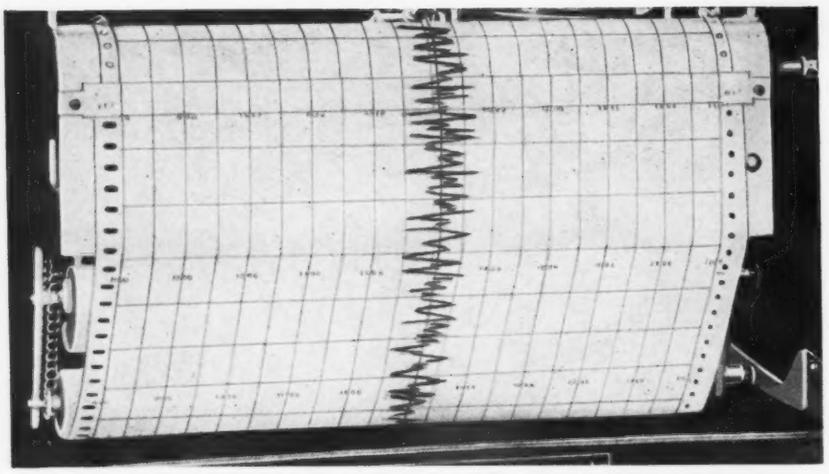
Above we show several pictures of a 3-conductor 250,000 C.M. varnished cambric, lead sheathed and armored cable designed for a central station to operate at 17,000 V.W.P.

The combination of technical and commercial advantages of Simplex Varnished Cambric Insulated Cables makes them especially suitable for high tension transmission, underground or submarine, as well as for switchboard wiring, power house and station wiring, borehole cable or transformer and oil switch leads.

Simplex Varnished Cambric Cables are made to a rigid, unvarying standard of quality and are well known for their dependability. Would you like further information on this type of cable to fit your particular problem? We will send it to you gladly.

Simplex Wire & Cable Co., Sidney St., Cambridge A, Boston, Mass.

Simplex —
Varnished Cambric Insulated Power Cables



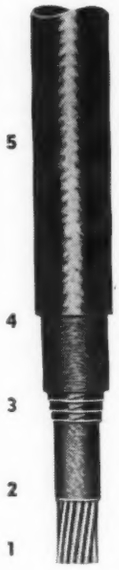
EVIDENCE!

Not an earthquake record—but evidence of an unsuspected cause of premature wire failure . . . *Vibration!*

Ever stop to consider its effects on wiring? New wire of any kind is little affected. It's when it has been up a few years and has hardened and dried out as a result of exposure to heat and atmosphere that *vibration* begins to get in its dirty work, causing the insulation to crack, flake and fall away . . . result: failure and a rewiring job.

Rockbestos insulation overcomes this hazard. It is basically asbestos, a million-year-old changeless non-metallic mineral that cannot harden, dry up, rot or otherwise deteriorate. It is *vibration-proof* and highly resistant to heat, moisture, oil, grease, acid fumes and vapors.

This resistance to both ordinary and extraordinary enemies of insulation is the secret of the steadily growing demand for Rockbestos. Users know it can be relied upon, not only when it is new, but for all time. There are savings from the elimination of circuit failures and costly replacement, plus savings in footage because Rockbestos can be run direct, regardless of vibration or severe conditions. Will you send for our catalog? Write Rockbestos Products Corporation, 844 Nicoll St., New Haven Conn.



Rockbestos A.V.C. Power Cable
1. Conductor
2. Felted Asbestos
3. Varnished Cambric
4. Felted Asbestos
5. Asbestos Braid

Also refer to Electrical World Buyer's Reference Number of Dec. 19, 1936, Part II.

ROCKBESTOS A.V.C.
the wire with permanent insulation

of 115/230-volt secondary lines, two and three-wire. Also for auxiliary equipment, including quantity of watthour meters. J. B. McCrary Engineering Corporation, Atlanta, Ga., are consulting engineers.

MOUNT PLEASANT, TEX.—Talco Asphalt & Refining Company, Capt. J. F. Lucey, Continental Building, Dallas, Tex., head, plans installation of motors and controls, motor-driven air compressors, electric-operated pumping machinery, transformers and accessories, and other equipment in new oil refinery at Mount Pleasant, where site has been acquired. A power station will be built. Entire project will cost about $550,000.

BROOKLYN, N. Y.—Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, receives bids until March 24 for 110,000 feet one-conductor submarine mine cable (Circular 133); also until March 29, for 15,000 feet of paper-insulated lead-covered telephone cable and 15 reels (Circular 135).

CLARKSBURG, W. VA.—Monongahela-West Penn Public Service Company, Fairmont, W. Va., has plans for extensions and improvements in lines and substation facilities in vicinity of Clarksburg, including addition to present Glen Falls power substation in that area, with installation of new bank of transformers totaling about 6000-kva., four 22,000-vol oil circuit breakers, switchgear and auxiliary equipment; a new control station will be built, to replace an existing structure. Entire project will cost close to $125,000.

HARTFORD, CONN.—Veeder-Root, Inc., Sargent Street, plans installation of motors and controls, regulators, conveyors and other equipment in new four-story addition to metal stamping and precision instrument manufacturing plant, for which superstructure will begin soon. Cost close to $150,000.

HUNTLEY, MONT.—Yellowstone Valley Electrification Association, Huntley, recently organized, plans primary and secondary lines for rural electrification in Yellowstone and neighboring counties, totaling about 135 miles, with power substation and service facilities. Fund of $155,000 is being secured through Federal aid. J. M. Garrison, State Water Conservation Board, Helena, Mont., is engineer.

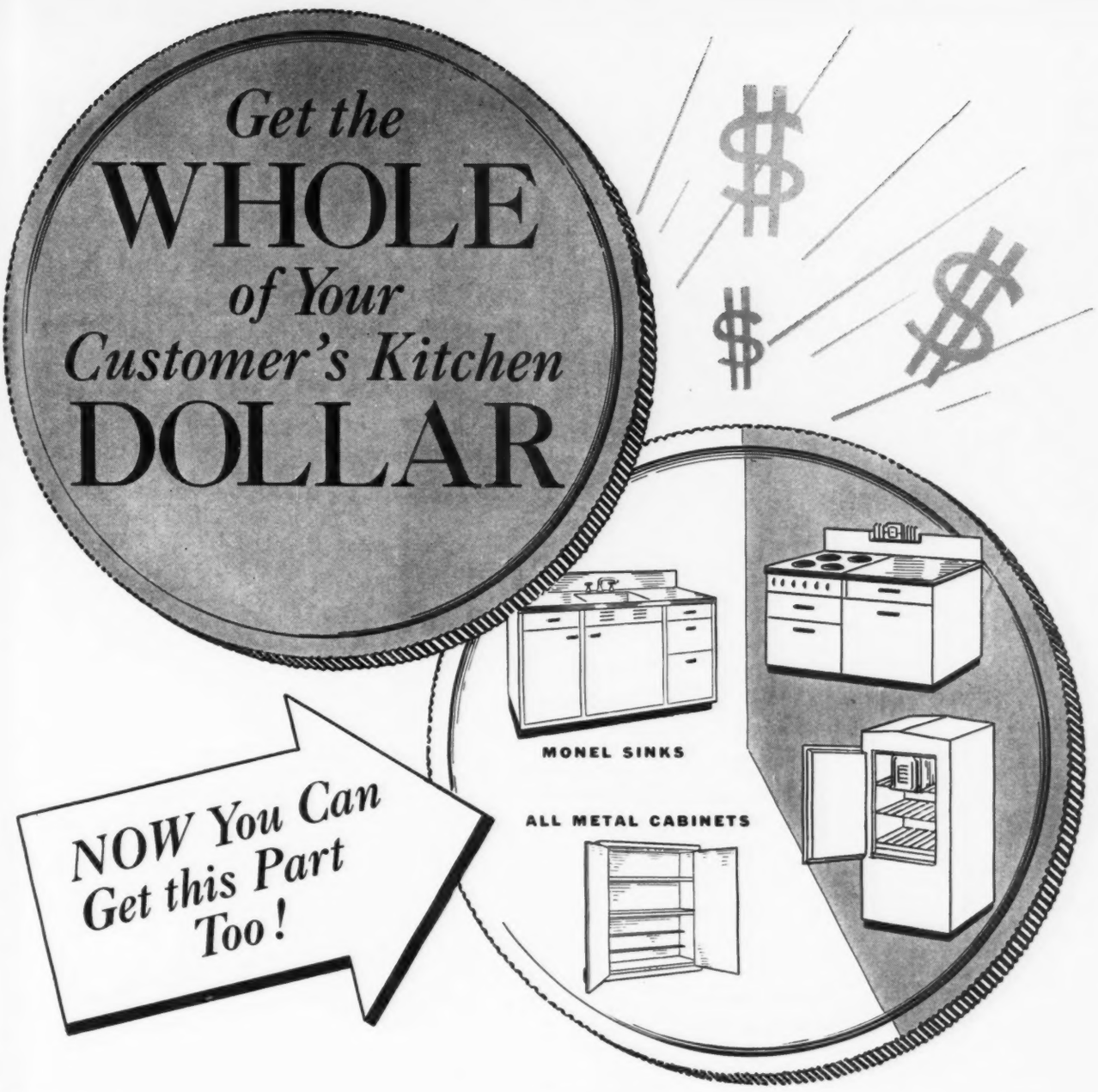
OXFORD, MISS.—Receives bids until March 22 for one 750 hp. diesel engine unit, with complete auxiliary equipment, for installation in municipal electric power plant, with alternate bids on similar units up to 1000 hp. rating, as per specifications on file. W. T. Chandler, city clerk.

SULLIVAN, MO.—Missouri Electric Power Company plans new 33,000-volt transmission line in Franklin County, where connection will be made with system of Union Electric & Power Company, which will use supply for distribution to a number of rural communities in that area. Permission has been secured. Cost about $50,000.

VIRGINIA, MINN.—Minnesota Power & Light Company, Duluth, Minn., has approved plans for new 110,000-volt transmission line from Duluth to Virginia, about 60 miles, and will begin work at once.

CHICAGO, ILL.—National Adhesives Corporation, 820 Greenwich Street, New York, N. Y., plans installation of motors and controls, conveyors and other equipment in new two-story adhesive products manufacturing plant at 36th Street and Washtenaw Avenue, Chicago, for which bids are being asked on erection contract. Cost about $175,000.

Get the WHOLE *of Your Customer's Kitchen* DOLLAR



LOTS of dollars in 1937 are going to someone for all-metal kitchens. Surveys show they head the list of things that people want. How does this affect *you*?

For you, this rising demand comes at just the right time: Every time you sell a Monel* topped range, you're giving someone a big push towards an all-metal kitchen. AND NOW YOU CAN SELL HIM THE WHOLE KITCHEN.

Here's what Inco offers you through Whitehead to make that possible. Cabinet Sinks of Monel, sizes from 48" to 144". (These can be built to hold your electric dishwasher, of course.) All-steel wall cabinets to fit and match, and base cabinets with Monel tops. So that with *your* range, *your* refrigerator and *your* dishwasher, these matched sinks and cabinets round out the whole job and *you* get the profit from the whole job.

You've found already in selling ranges that your customers want Monel. Since you get the sinks and cabinets all from one manufacturer, you equip the whole kitchen with no bother, and at low cost.

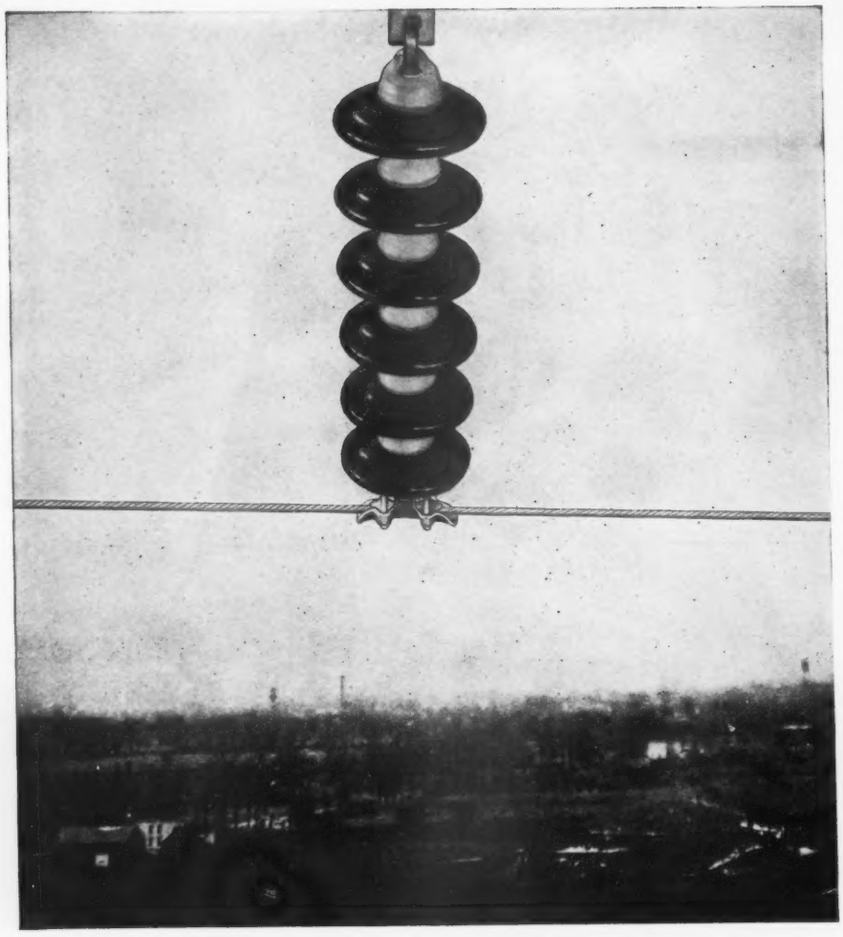
To help you meet this rising interest in matched kitchens, Whitehead offers you this added feature: A kitchen planning service, run by architects who work from dimensions *you* give them. They fit the standard units to suit each customer's kitchen—at no cost to you. For full details and prices, write at once to

THE INTERNATIONAL NICKEL COMPANY, INC.
67 WALL STREET NEW YORK, N. Y.

INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York, N. Y.
Gentlemen:
Kindly send me the list of electric ranges with Monel tops, and have your representative call on me to explain "Complete Kitchens."
I sell the following ranges:.....
.....
Name.....
Firm.....
Address.....*City and State*.....
EW 3-13-37

MONEL

*Monel is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. This alloy is mined, smelted, refined, rolled and marketed solely by International Nickel.



This photograph was taken in our studio. (Background effect obtained by paper negative, half-printed in.) The string is in duplicate of one in actual use on a prominent line. Details of line may be had upon request.

Hardware Used

BTC Drop Forged, 3001 Hook
BTC Drop Forged Caps
BTC Drop Forged, 6203 Clamp
with aluminum liners

For uniform metal
For added strength
For dependable lines
Specify Drop Forgings

If it's Hi-Line Hardware - it's in this Book

. . . Sold through Your Insulator Mfr. Only

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Cortland, New York

BOOK REVIEWS

Electrical Measurements

By Harvey L. Curtis. Published by McGraw-Hill Book Company, 330 West 42d Street, New York, N. Y. 302 pages, illustrated. Price, $4.

There has been need for a compilation of precise techniques in making absolute electrical measurements and ways of comparing standards accurately. With his years of experience at the Bureau of Standards to draw upon, no one is better qualified to do this than the author. For completeness, the history of the electrical units and standards and the mechanical units on which they are founded is included. Further, there are chapters recording the procedure in building the physical standards of R, L and C and the standard cells.

Before proceeding to computations of L, there are chapters on comparing standards. The final six chapters then deal exhaustively with the determination of the absolute standards. Appendices deal with elliptic integral calculations and analysis of the effects of errors in setting up inductance computations from coil measurements. The book is thus the desired compendium of the paths to ultra-precision in electrical determinations.

•

Municipal Ownership of Electric Undertakings in Virginia

By R. A. Egger and J. E. Gates. Published by University of Virginia, University, Va. 132 pages (mimeograph). Price, $1.

Practices among municipal utilities quite as quaint as the rates Morris L. Cooke once found among private utilities are disclosed in this exhaustive study by a university staff that presumably would not bemoan universal government ownership. But they have to give the kiss of Iscariot to the agreeable managers from whom they collected their data—record systems are characterized as eccentric or amazingly original, load building is found to be neglected and rates found relatively high for the larger blocks of consumption.

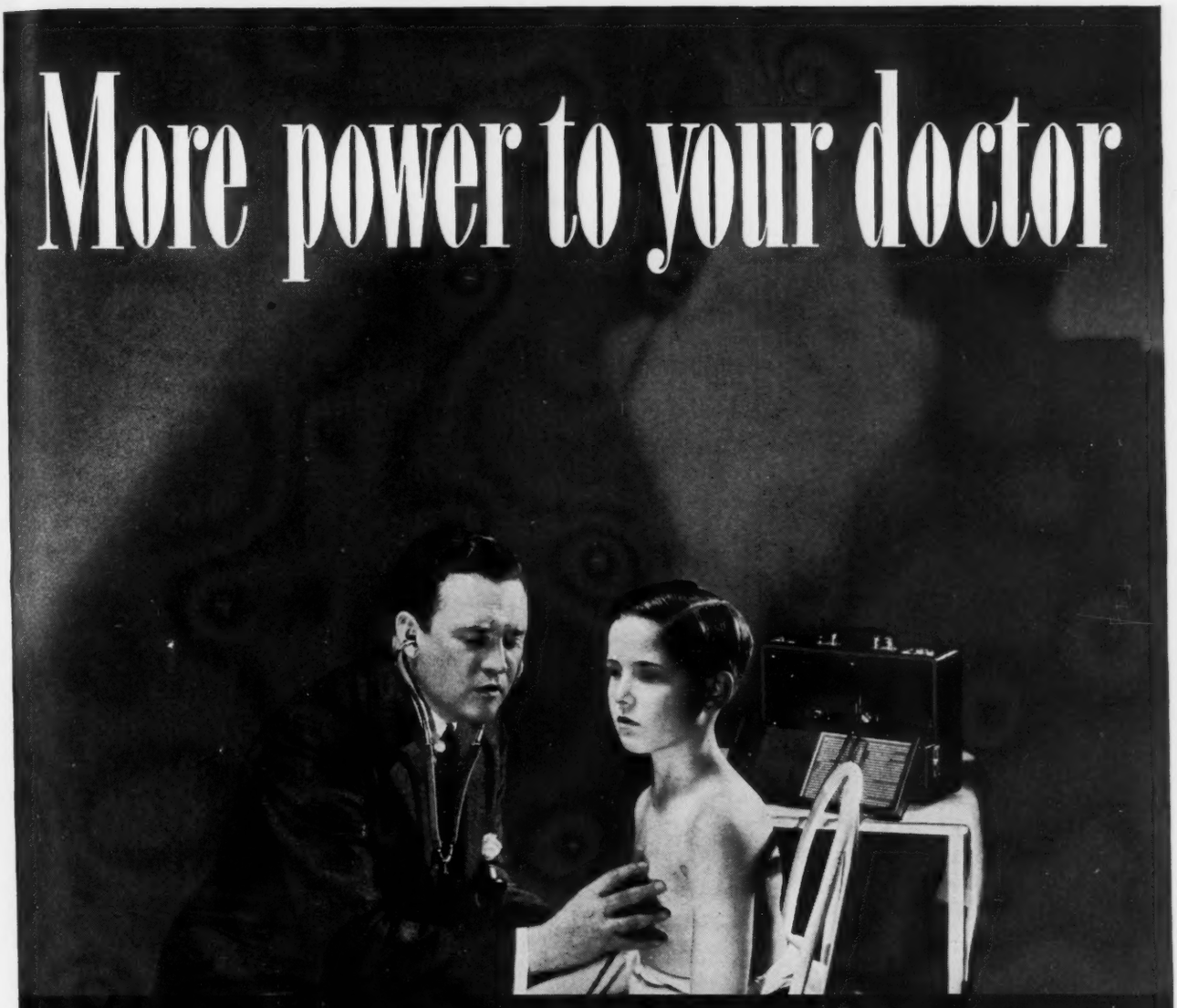
Danville has 50 years behind it and seventeen others have survived, but 25 more lasted only fifteen years on the average because they allowed their plants to depreciate disastrously. Some managers today admit they "don't know whether they are bleeding the plant or not." Load factor studies are neglected and merits of load promotion are ignored. The cure recommended is advisory supervision by the State Corporation Commission. The report is well documented with statistics, chronology and citations. It is a welcome addition to the literature of public ownership.

•

Electric Trackless Trolleys

The South Carolina State Public Service commission has granted a petition of the Duke Power Company allowing substitution of all remaining parts of its electric railway system in the city of Greenville with electric trackless trolleys. Schedules and fares will remain the same.

More power to your doctor



. . . thanks to Bell Telephone makers

Your doctor can hear your heart beat more clearly today than ever before — with Western Electric's new Electrical Stethoscope.

Not much bigger than the doctor's "little black bag," this amazing instrument amplifies heart sounds up to 100 times the intensity obtained with an ordinary stethoscope. It also isolates and accentuates hard-to-hear murmurs—makes diagnosis easier.

The Electrical Stethoscope is closely related to your telephone—Western Electric's best known product. It was developed by Bell Telephone Laboratories as a scientific contribution to the medical world, which has given it a warm welcome.

Distributed by GRAYBAR *Electric Co. In Canada: Northern Electric Co., Ltd.*

Western Electric

LEADERS IN SOUND-TRANSMISSION APPARATUS

The "HEADMAN"

in an Industrial Plant
is the MOTOR BRUSH

You may have the most modern machinery in the world, equipped with the finest motors—but they can and frequently are tied up in a knot by the failure of a motor brush.

If this motor brush is not a thoroughbred in every sense of the word—that is in **Uniformity, Quality Materials** and **Construction** it cannot stand up under mechanical shocks, overloading, etc. Ohio Carbon Brushes have been for years the choice of thousands of large and small industrial plants thruout the entire world.

Do as thousands have been doing, use Ohio Carbon Brushes and avoid expensive tie-ups and delays.

THE **OHIO CARBON** CO.

12508 BEREA ROAD · CLEVELAND OHIO

Co-ordination of Fuse Links

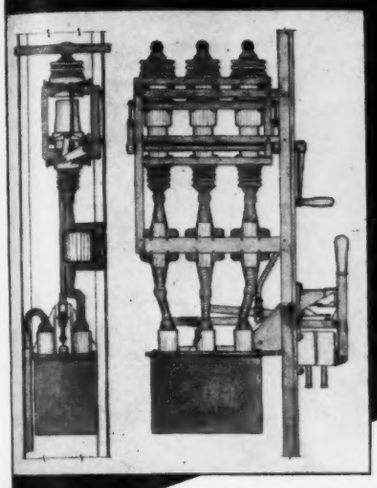
[*Continued from page 49*]

link curve approaches the knee of the relay curve at from 600 to 800 per cent load on the fuse. With less than this range of load on the fuse the fuse link curve rapidly bends away from the relay curve and approaches the point at which the time of fuse operation would not affect the relay. With a greater range of load the operating time of the fuse rapidly decreases, while the relay time decreases at a much slower rate.

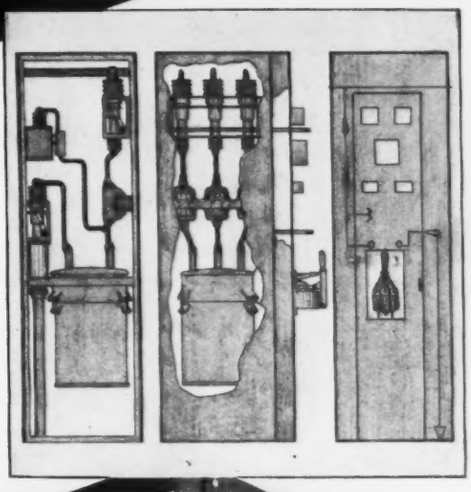
If a difference of 18 cycles or 0.3 of a second, for instance, is selected as the minimum difference between the operating time of the fuse and relay, inspection of Fig. 2 will determine the minimum distance from the overload relay at which the size fuse link under consideration should be installed to assure co-ordination. In this case, if a relay pick-up setting of 500 per cent of the fuse size is considered satisfactory for the majority of cases, 100-amp. fuses could be used up to the point where a line short circuit would give a maximum fault current 800 per cent of the fuse size and 60- to 75-amp. links could be used up to the point where maximum fault current would be 1,000 per cent of the fuse size. A ratio of 500 per cent would result in a high pick-up current for the larger size fuse links (500 amp. for a 100-amp. fuse link), so that a lower ratio of relay operating current to fuse size might be desirable for most cases. If, for instance, a ratio of 400 per cent for 100-amp. links were used the minimum distance from the substation at which 100-amp. links should be installed would be the point at which the maximum short-circuit current would be 550 per cent of the fuse size, or 550 amp. If it were necessary to install a 100-amp. link nearer than this point the relay pick-up setting would have to be increased, the time lever setting would have to be increased or a faster 100-amp. fuse link would be needed.

Experience may indicate the fuse link time-current characteristic is most accurate at heavy overloads and therefore a smaller difference between fuse and relay operating time is permissible above the knee of the relay curve. If this should be the case the main point to consider in the selection of fuse links for co-ordination would be where the fuse link approaches the knee of the relay curve.

By Unusual Adaptability · Space Economy ··· and Dependable Service



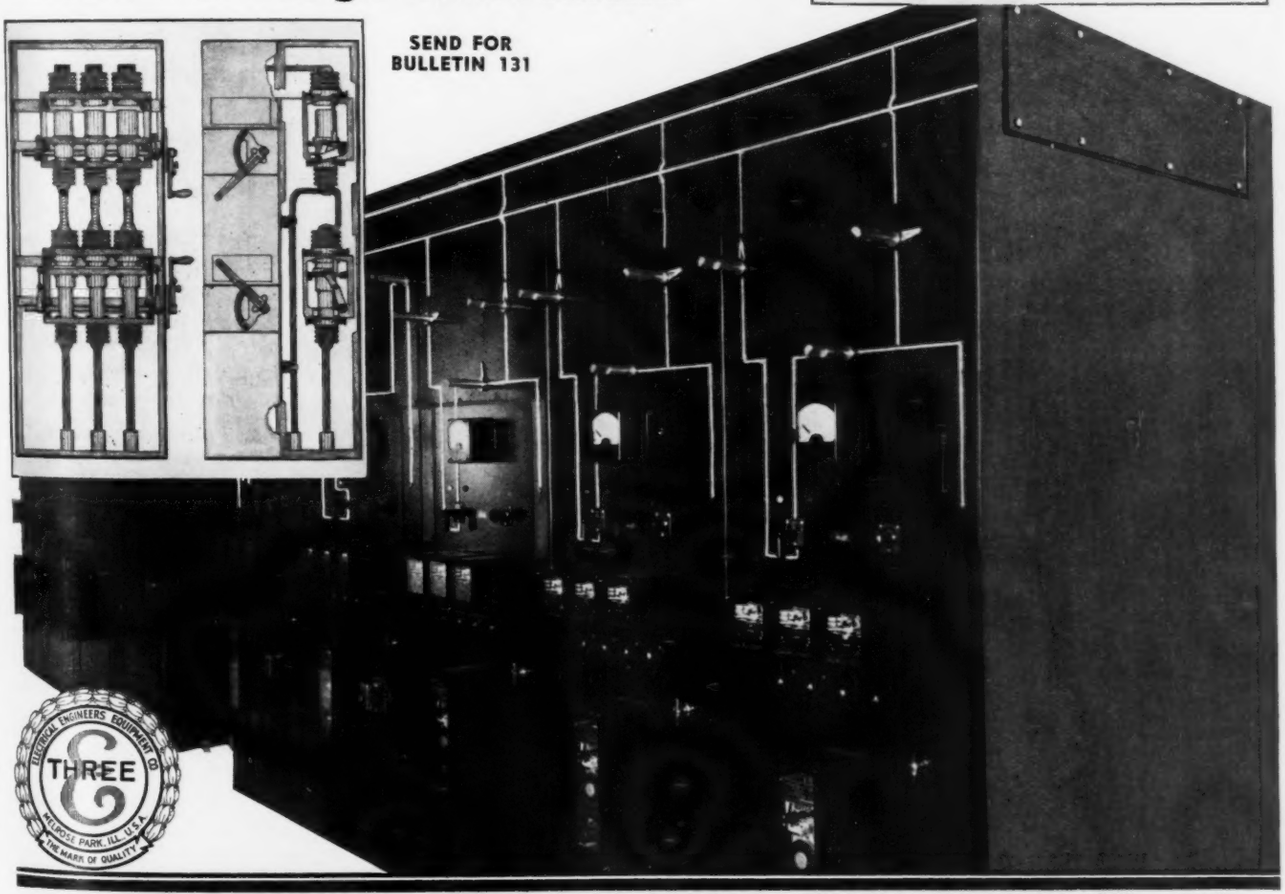
"3-E"



ISOLATORS

are completely revolutionizing cubicle construction and setting records in design achievement.

SEND FOR BULLETIN 131



ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILL.

NEW YORK STATE'S LATEST

Troy-Menands Bridge

Albany Rensselaer Bridge

THE CITY OF BUFFALO'S

Michigan Avenue Bridge

are protected in emergency with

STERLING HIGH DUTY

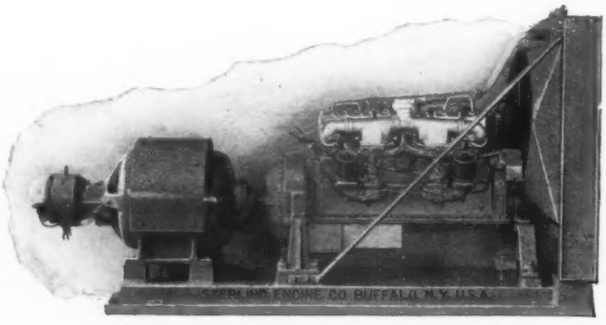
Sterling

THE ENGINE OF REFINEMENT

INTERNAL COMBUSTION ENGINES

The same Sterling Stationary engines which are employed for standby in 1200 cities and villages are used to guard against power interruption.

STERLING ENGINES—*for peak load and standby*
GAS—GASOLINE—OIL ENGINES



On the Troy-Menands Bridge, Troy, N. Y., a 45 KW General Electric generator driven by a Sterling Petrel 6 cylinder 115 H.P. 1200 R.P.M. engine, direct connected.

STERLING ENGINE COMPANY

Home Office and Plant
1270 Niagara Street
Buffalo, New York

Dept. C-2

Branch Office
900 Chrysler Bldg.
New York, N. Y.

Identifying Code Simplifies Meter Bookkeeping

[*Continued from page 55*]

gamo Type HF meter for multi-circuit metering, rated at 50 amp., 220 volts.

Symbol covers demand features

To identify meters equipped with demand type registers and to identify the type register code letters are added to the usual code groups that indicate the meter type. So 53-JM indicates a 25-amp., 220-volt, three-wire General Electric Type I-16 equipped with an M-20 demand register. SP-103-HF3HG indicates the 50-amp. Sangamo multi-circuit meter equipped with a type HG demand register.

Meters equipped with contacts for operating demand meters are identified by the letter W following the usual type code group. Y1-307-EW indicates a General Electric Type D-6 with contacts.

It is the practice of Oklahoma Gas & Electric to use transformer type meters with the register ratio corresponding to the meter rating without instrument transformers on metering installations for temporary service. Frequent load changes make necessary frequent changes in current transformer sizes. If the usual practice of having multipliers of 1, 10, 100 or some multiple of 1,000 were followed it would be necessary to change the register and test the meter when current transformers are changed. By using the register ratio corresponding to the meter rating without transformers it is only necessary to change the multiplier. The multiplier will be equal to the product of current and potential transformer ratios.

Meters to be used on temporary service, as just described, are coded according to their rating without instrument transformers. Y1-11-OB2 would indicate a 5-amp., 110-volt meter, transformer type, with a basic register. The current and voltage of the circuit being metered can be determined only by checking current and potential transformers.

The code, as here described, was developed by ideas, and to fit the conditions, in the Oklahoma Gas & Electric Company. For use by another company, it would probably have to be somewhat modified and changed in details. From this description the central idea should be clear and be readily adaptable to other conditions.

DUST SEPARATION

33. **Folder, 4 pp., on the Buell Dust Collector Buell Engineering Co.** This folder describes the Van Tongeren system of fly-ash and dust extraction. Performance curves compare work of this type of extraction with that done by the cyclone type.

DISTRIBUTION TRANSFORMERS

34. **Catalog 116. American Transformer Co.** Recent price changes are listed in this catalog of American distribution transformers. Catalog is divided into two sections: a descriptive section and a data section.

SPEED CONTROL

35. **Form A-181, 4 pp. New Departure Mfg. Co.** Features of Transitorq, variable speed transmission mounted like a motor, are listed. Typical installation pictures indicate how the device may be used to provide "a million speeds at the touch of a finger."

THERMOMETERS AND HYDROMETERS

36. **Blue Book for Science and Industry," Parts I, II, and III, 28, 16 and 20 pp. H-B Instrument Co.** This company's line of thermometers and hydrometers are cataloged in these three booklets. Part I covers their thermometers for industrial and scientific use; Part II is devoted to their hydrometers and Part III treats of their industrial indicating and recording thermometers.

AIR CIRCULATORS

37. **Bulletin No. 183. Wagner Electric Corp.** Air circulators, exhaust fans, ventilating fans, window ventilators and ceiling fans are included in the 1937 line offered by this company. Four new types are shown in this booklet.

COTTON MILL MOTORS

38. **Leaflet 2241, 4 pp. Allis-Chalmers Manufacturing Co.** Leaflet describes and illustrates new custom-built "Quick Clean" motors for cotton mills or similar location, where protection against lint accumulation in the motor is desirable without sacrifice of sturdy construction and good performance.

VIBRATION INSULATION

39. **"Vibro-Insulators," Catalog Section 7900, 4 pp. The B. F. Goodrich Co.** Rubber suspensions for heavy factory machinery are herein discussed. Specifications of the three types are tabulated and a typical installation is pictured. Mounting methods are sketched.

CHROME STEEL

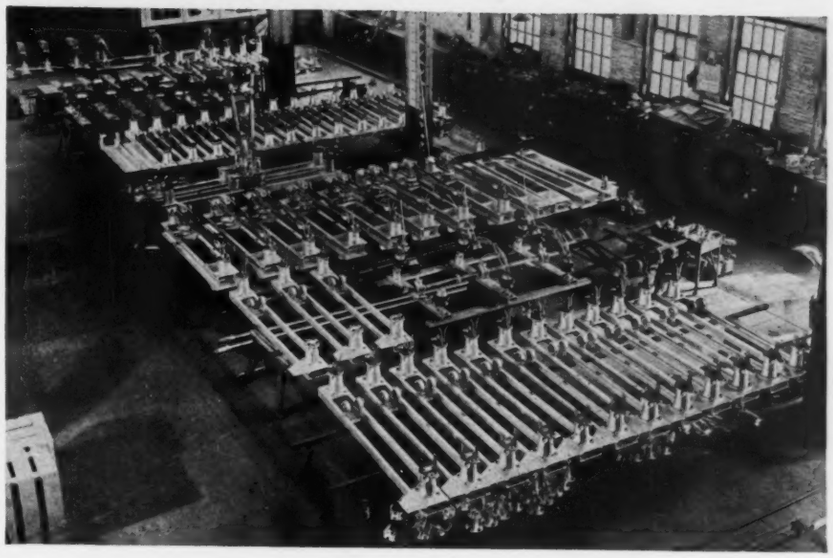
40. **"Electrical Devices from American Bonded Metals," folder. American Nickeloid Co.** This folder illustrates some typical uses of chrome steel in various electrical devices. A sample of the metal is included in the folder.

GRAPHIC INSTRUMENTS

41. **"Solving Industrial Crimes, Case No. 14," 16 pp. The Esterline-Angus Co.** Feature of this booklet is an alphabetical listing of types of companies that find use for graphic instruments for recording various production factors.

The production line at

ELPECO



typifies the demand for quality switchgear

The above photo illustrates a typical production line of switchgear at the ELPECO plant in Philadelphia.

Included are the standard and special Type 180's . . . the well-known Push & Pull . . . the ever-popular Type S Tilting Switch.

"ELPECO'S quality and service have always been recognized."

Bulletins on request.

Electric Power Equipment Corp.
412 North 18th St., Philadelphia, Pa.

Please send your NEW catalog to this address.

Name .....

Company .....

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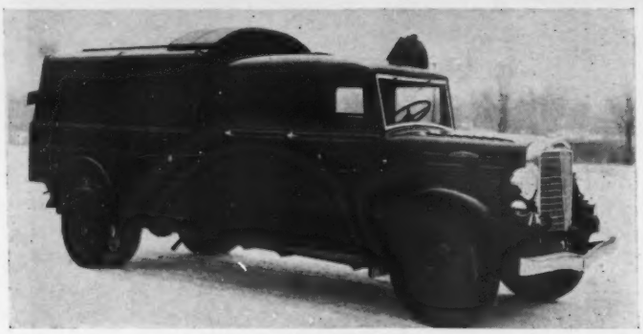
Highway BODIES

DESIGNED FOR DURABILITY AND APPEARANCE AS WELL AS ACCESSIBILITY AND CONVENIENCE



APPEARANCE for Good Will

DESIGNED for the Job

COMFORT for the Crew

Bodies furnished complete with Highway Winches, Derricks, and associated equipment to fully complete the line construction and maintenance truck. Send for descriptive literature

HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

Hints on Uses of Photo-Electric Counting

[*Continued from page 59*]

light relay to the proper counter in accordance with the brand that particular scale is handling. These features are shown in Fig. 4, which is a diagram of the electrical circuits.

The diagram also covers a system of indicating lights and warning horn to show the packing house foreman what brand is being packed on each scale and to insure the proper manipulation of the double-throw switch whenever a scale is transferred from one brand to another. Mercury switches are provided on the spout gates which deliver the two brands to the scales. If the position of these gates is changed and the counter control switch is not thrown into the proper position the warning horn blows until the operator corrects this error.

•

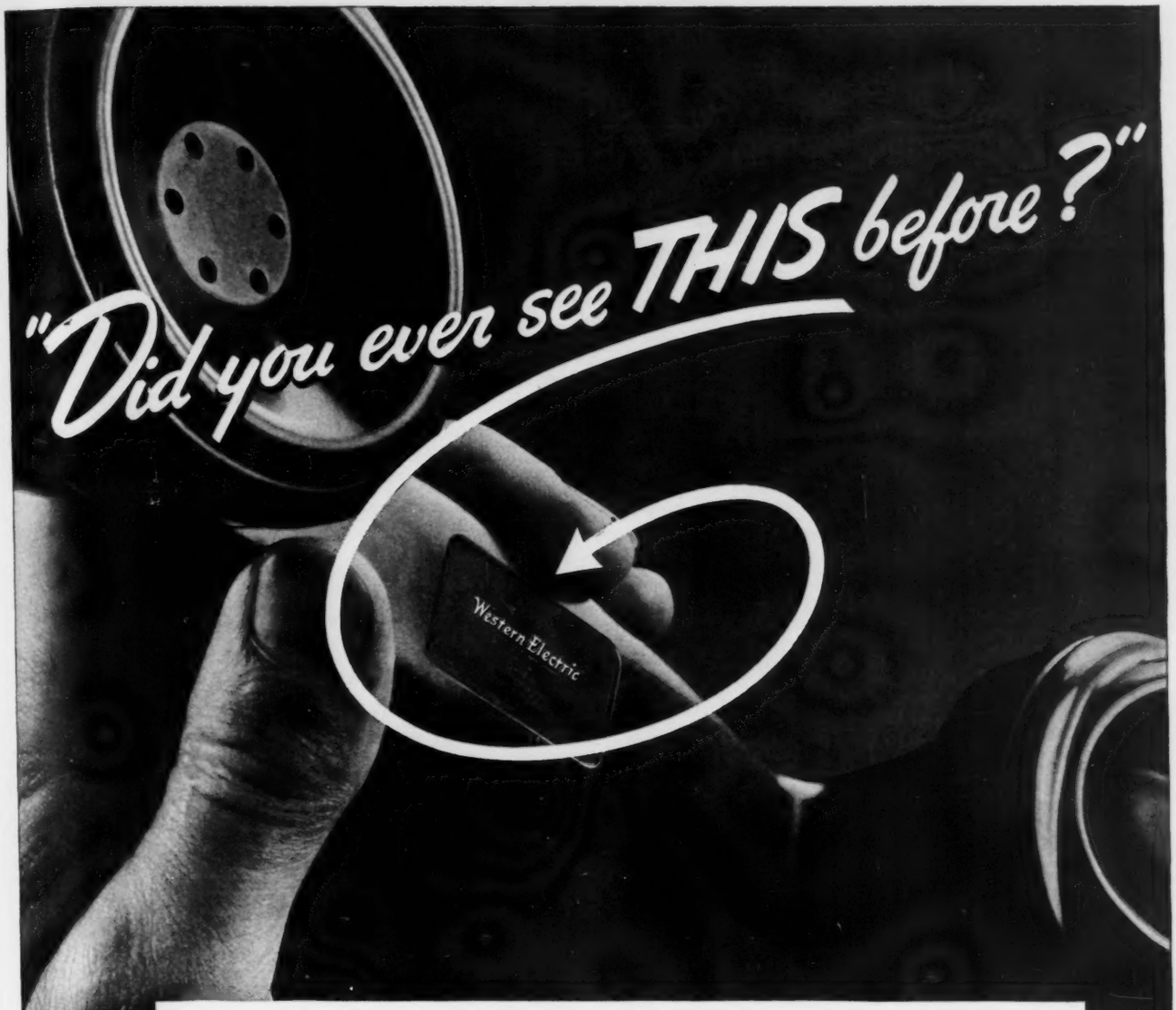
British Electricity Output Continues Increase in 1937

The steady increase in British electricity output registered in 1936 is being continued in 1937. Official returns just rendered to the British Electricity Commission show that 2,172,000,000 units of electricity were generated by authorized undertakers in Britain during January, an increase of 202,000,000 units, or 10.2 per cent, compared with January last year. The number of working days in the month was 26, against 27 last year, which suggests that for an equal number of working days the increase would have been substantially higher.

•

Combustion to Handle "Elesco" Superheaters

With a view to promoting closer co-ordination in handling the details of complete steam-generating units, and thereby to better serve the industry, certain functions and personnel of the industrial department of the Superheater Company have been transferred to Combustion Engineering Company, Inc. This concerns the sales, engineering and servicing of "Elesco" superheaters and economizers for stationary plant installations, the manufacture and inspection of which will be handled, as heretofore, at the East Chicago works of the Superheater Company.



INCONSPICUOUS but important is the name "Western Electric" on your telephone.

You may never have noticed it, yet it has been there for years. And it has a great deal to do with the quality and low cost of telephone service.

Western Electric has been making Bell System equipment for over half a century. Its specialized production and purchasing have enabled the operating companies in the Bell System to buy equipment and supplies of the highest quality at reasonable prices.

Western Electric serves further by maintaining a nation-wide system for the rapid delivery of material and apparatus. This is an important factor in providing good telephone service from day to day and speeding its restoration in time of fire, flood or other emergency.

Western Electric is an integral part of the Bell System and has the same objectives as the rest of the organization. It plays its part in making telephone service dependable, efficient and inexpensive.

BELL TELEPHONE SYSTEM

KLEIN CLIMBERS

Klein Climbers are made in standard and "light weight" styles, each the finest for its particular use.

Going up a sixty foot stick — working on wires high above the ground — a slip might be fatal — a spur that cut out a genuine hazard. The lineman throws his weight on his climbers with calm confidence — he knows they are Kleins. Klein Climbers, like all Klein tools, are the standard of quality in the electrical and public utility field.

DISTRIBUTED THROUGH JOBBERS

Foreign Distributor: International Standard Electric Corp., New York

---

The four pamphlets listed below will be sent without charge to anyone interested. Check the ones you want:

- ☐ **Safety for the Pole Climber.**
- ☐ **Specifications on Linemen's Belts and Safety Straps.**
- ☐ **The Safety Factor on Linemen's Leather Goods.**
- ☐ **Pocket Tool Guide.**

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill. U.S.A.
3200 BELMONT AVENUE

Astatic Relay Keeps Voltage Regulated

[*Continued from page 61*]

odical attention or maintenance, since there is no wear or arcing of open contacts, and the mercury switch is capable of an unlimited number of operations, since there are no spring tension adjustments.

Combination of the astatic relay with the moving coil regulator results in a complete, fully automatic voltage regulator, requiring no periodical attention, maintenance or inspection.

In conclusion, when the new relay is used with induction regulators or step-type boosters, objectionable features such as open contacts, control springs, hold-on devices and auxiliary relays are eliminated. This simplification has been achieved by avoiding undesirable features and not at the expense of reliability or convenience. When combined with the moving coil voltage regulator and the simplified control gear referred to above the astatic relay directly controls the regulator driving motor and no auxiliary apparatus at all is required. These relations are illustrated in an accompanying illustration. The complete automatic control of a voltage regulator involving only a voltage relay and a driving motor would appear to be the limit in simplicity and reliability.

•

I.E.C. to Issue "Vocabulary"

The International Electrotechnical Commission plans publication of the first edition of its international "Vocabulary" in the near future. This work, undertaken soon after the St. Louis Electrical Congress in 1904, contains some 2,000 scientific and industrial terms used in the various branches of electrotechnics. As the edition will be limited, copies should be reserved at once by writing to the United States National Committee of the International Electrotechnical Commission at 29 West 39th Street, New York. Price will be about $2.50.

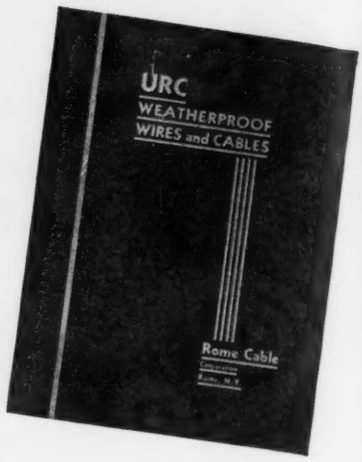
•

Rural to Build Power Plant

Plans have been made by the Federated Co-operative Power Association, recently organized at Iowa Falls, Iowa, to build a power plant near Bradford. The government has approved a $225,000 loan for construction of the plant.

WEATHERPROOF WIRES AND CABLES

U. R. C.



A copy of bulletin W.P.-1 will be mailed promptly on receipt of request.

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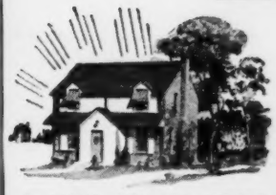
Kelvinator goes on the air March 6TH!



A NEW KELVIN HOME

The first prize in Kelvinator's Big Radio Contest will be a Kelvin Home, complete with year 'round air conditioning, electric or gas range, electric refrigerator, constant hot water, electric laundry equipment. The last word in modern living!

Half-hour Program

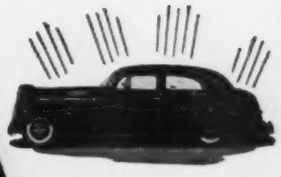
SATURDAY EVENINGS AT 8:00 E.S.T.

COAST TO COAST HOOK-UP OF 55 STATIONS ON THE COLUMBIA CHAIN

TWO BIG CONTESTS

FIRST PRIZE—A KELVIN HOME

AND MORE THAN A THOUSAND OTHER PRIZES INCLUDING NASH CARS • REFRIGERATORS • ELECTRIC AND GAS RANGES • WASHING MACHINES • ELECTRIC IRONERS • AND CASH



A NASH AUTOMOBILE

Included in the other prizes will be completely equipped Nash cars—one of the country's finest and most beautiful automobiles. Big, roomy, perfectly appointed automobiles, that anyone would be proud to win and drive.

A program built to produce FLOOR TRAFFIC

Kelvinator will not only have a thrilling program that will appeal instantly to everyone, but will have two big contests that will bring people in great numbers to the stores of Kelvinator dealers.

The contests are fascinating and yet so simple that anyone can enter with a real chance of winning. There is nothing to buy—no tiresome essays to write, but every contestant must visit a Kelvinator dealer in order to secure entry blanks and rules of the contests. This means Floor Traffic for Kelvinator dealers—and because of the nature of the contests, it will mean floor traffic composed of men and women who will be anxious to learn all they can about Kelvinator appliances for their homes.

And this radio campaign with its Two Big Contests is only one of the many sales promotion features of the 1937 Program. Only one of the things which is going to make 1937 the greatest year in history for Kelvinator dealers and salesmen.

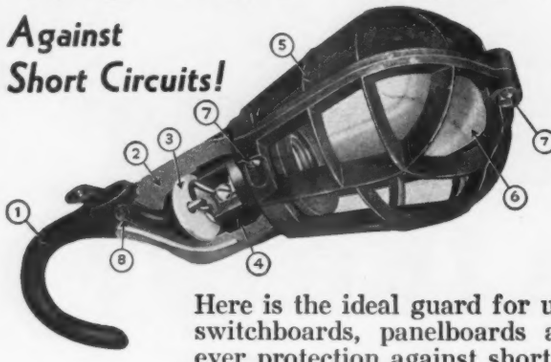
KELVINATOR • DIVISION OF NASH-KELVINATOR CORPORATION
DETROIT, MICHIGAN

Kelvinator

ELECTRIC REFRIGERATORS • RANGES • WASHING MACHINES • IRONERS • AIR CONDITIONING EQUIPMENT

PROTECTION

Against Short Circuits!



McGILL Portable Lamp Guard No. 999

Here is the ideal guard for use around switchboards, panelboards and wherever protection against short circuiting is vital.

1—Hard, molded rubber hook with steel core.

2—Pliable, molded rubber vulcanized to rubber hook.

3—Heavy fibre disk resting on solid rubber ledge to hold wires—knotted for relieving pull and strain on socket connections.

4—Special McGILL 660-watt, weatherproof Levolier socket.

5—Short-proof, spark-proof, molded Insurok cage.

6—Built-in reflector.

7—Countersunk screws at end and at base.

8—Symbol of Underwriters' Laboratories.

ORDER FROM YOUR WHOLESALER

McGILL MANUFACTURING COMPANY

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Recent Legislation

Many new bills affecting the electric light and power industry are under consideration by the various state legislatures, as follows:

ARKANSAS—A bill has been introduced in the Assembly which would levy a 2 per cent excise tax on producers, distributors and operators of public utility services. The bill specified that the new tax shall be in addition to all existing taxes and that the tax shall not be passed on to consumers in any manner. It would prohibit any commission, board or commissioner "by whatsoever name now existing or hereafter created" from setting aside the tax or authorizing the utility companies to increase rates to offset the tax. A bill to provide for the state's participation in the federal rural electrification program has been introduced in the House. The bill is one approved by the Governor's office, the State Public Utilities Department and by the R.E.A. in Washington. Except for a few minor changes to meet conditions in the state, the bill is the same as that sponsored by the R.E.A. in practically all states in the country.

CONNECTICUT—Bill has been introduced in the Legislature that would provide for a commission to investigate electric light and power rates and to survey means of extending service to people through public ownership of industry, and to recommend acts to the Legislature for the acquisition of state-operated system for the manufacture and sale of electric energy.

INDIANA—Two bills backed by Indiana Municipal League were introduced in the House by William J. Black of Anderson. One proposes to exempt municipal utilities from all taxation and the other would remove them from any supervision by the Indiana Public Service Commission and the State Board of Tax Commissioners, giving the Common Council of the municipality full authority to have them constructed, operated and financed. Another bill would put in effect rate reductions as of the date on which the complaint was filed with the commission, although the commission would be authorized to set a later date for a good cause. Backed by several co-authors, a bill has been introduced closing to other utilities the territory served by companies formed under the rural electric membership corporations, except by specific order of the public service commission.

MAINE—A bill which proposes to tax electric power companies 4 per cent of their annual gross incomes was introduced in the Legislature. The bill provides that electric power companies furnish the commission a complete list of its shareholders, the amount of capital stock and the number and par value of its shares.

MARYLAND—There would be a sharp increase in the income tax on gross receipts of domestic and foreign electric light and power companies doing business in the state under the terms of a bill which has been introduced in the General Assembly. The present tax on gross receipts is 1 per cent, but under the terms of the proposed law it would be increased to 5 per cent.

MASSACHUSETTS—Utilities will not be forced to provide free lamp renewals as an indirect rate reduction, judging from the recent adverse vote of the House of Representatives upon five bills designed to restore the former practice. Opponents of

There's more to a BRUSH than

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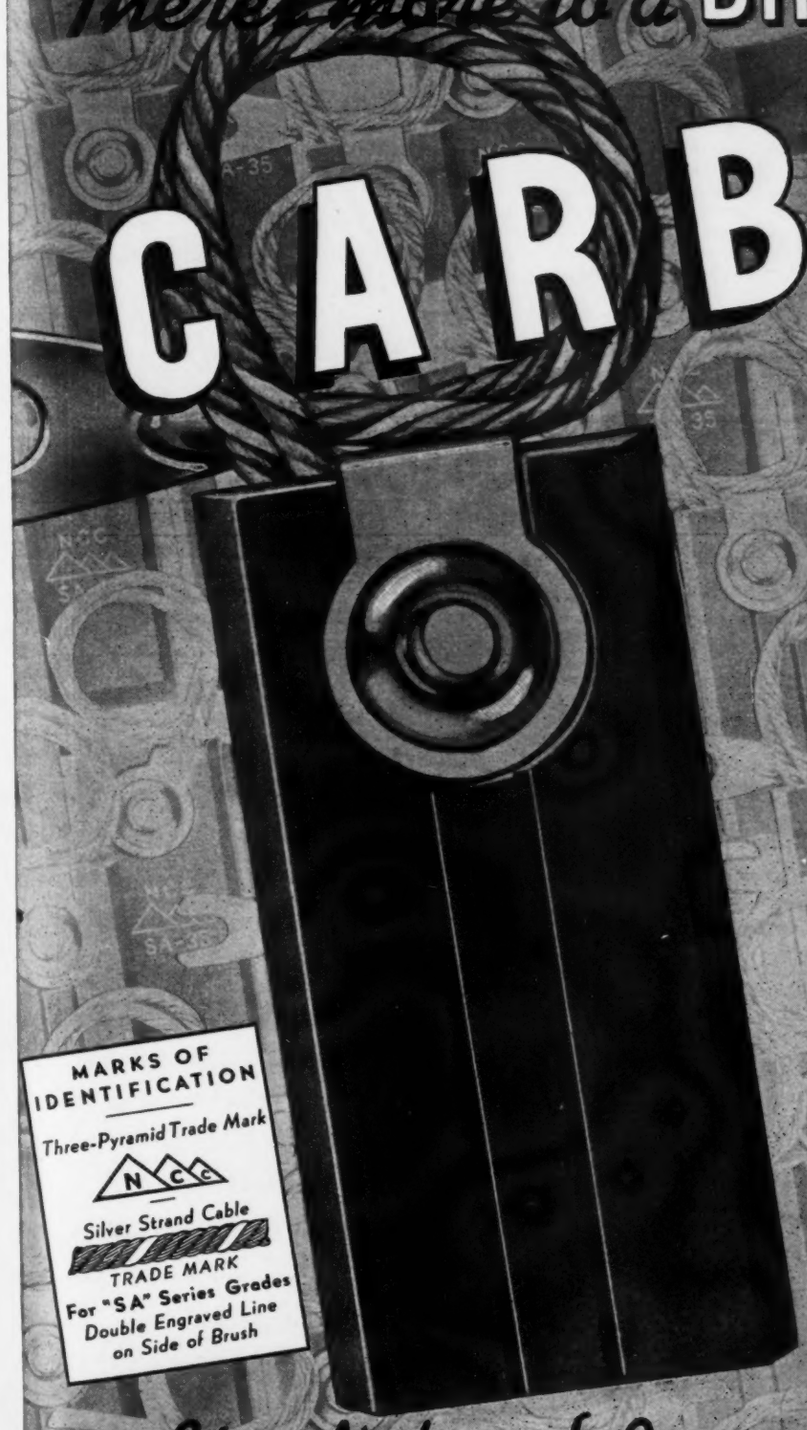

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Almost any brush will show superiority over others that are giving trouble. It takes real quality to show better operation than brushes previously considered satisfactory. Speer welcomes comparison with brushes that are considered satisfactory now.

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the bills challenged their constitutionality before the power and light committee, contending that free refrigerators and electric irons were as logical as free lamps. Lieutenant-Governor Kelley led an attack on the previous ruling of the state utilities commission which eliminated the free lamp renewal custom, but went down to defeat by a vote of 109 to 103. The legislative committee on state administration heard bills which would provide for the public election of public utilities commissioners.

NEBRASKA—Two measures have been introduced providing for regulation of co-operative organizations to aid in rural electrification. The first provides that co-operative companies borrowing funds from federal agencies for rural electrification, where the majority of stock is held by the government or a governmental agency shall be exempt from law banning borrowing more than two-thirds of their capitalization. The other measure authorizes creation of co-operative non-profit membership corporations organized to engage in rural electrification; defines power and requires making of rates sufficient to preserve financial structure and exempts government borrowings from blue sky regulation. Another measure provides for the complete reorganization of the state railway commission "to make its members more immediately answerable to the people." This measure proposes election of five commissioners.

OHIO—Three measures affecting utilities have been introduced in the Ohio Senate. One bill would prohibit utilities from making charges for any service connection, installment or disconnection. Another would prohibit utilities from engaging in the sale of goods or merchandise, except such equipment as is necessary for the installation of the particular utility service, and another would exempt properties rented by utilities from taxation.

NEW HAMPSHIRE—House bill 302 would place a tax on electricity generated within the state and transmitted outside for consumption of 7 per cent on the price to the ultimate consumer.

NEW YORK—Extension of the authority of the New York State Public Service Commission over rates of municipally owned power plants and at the same time limiting rates of such plants to the cost of service was asked in a recent bill proposed to the Legislature. The legislation carries out a recommendation of Governer Lehman in his annual message. Another bill would give the commission authority to prescribe uniform methods of measuring and accounting for depreciation of utilities under its jurisdiction. The rate bill is designed to remedy the situation caused when the Court of Appeals decided that the commission was without authority to fix rates of municipal plants. The case arose over the rates of the municipally owned plant of Booneville. Under the provisions of another bill introduced in the Assembly and referred to the Public Service Committee, the Public Service Law is amended by defining "gas and electric submetering corporations," specifying and making provision for regulation by Public Service Commission and requiring other business of operator to be kept separate and same not to be subject to provisions of Public Service Law.

NORTH CAROLINA—Governor Hoey has stated that it has been decided at a conference to hold up further legislative consideration of a bill to require rural electrification co-operatives to get certificates of convenience and necessity until he could confer with federal authorities. The measure received a favorable report from the

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A simple, rugged cable laying plow that saves expensive trenching and back-filling — eliminates costly pole line construction. The answer to rural electrification and parkway problems.

Lays single cable up to 1¼". Two cables up to 1" dia. To depth of 16" to 20". Drawn by truck winch, portable winch or tractor. Small crew. Completes job as it goes. Saves time — money.

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Note how clearly detail stands out under Cooper Hewitt mercury lamps in this shop.

Every part of your plant floor gets productive light with Cooper Hewitts. The long light source banishes harsh shadows that formerly made seeing difficult and slowed down production. All parts of even the most complicated mechanism receive an adequate measure of detail-revealing Cooper Hewitt light.

For thirty years Cooper Hewitt mercury lighting has been the standard of industrial illumination. Now, by the addition of incandescent lamps in the new Combination units, lighting that closely approximates daylight can be obtained. Color perception and discrimination are facilitated.

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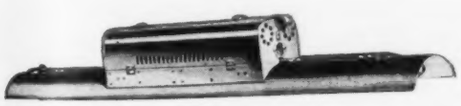

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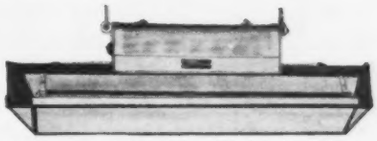

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That is one of the reasons why utilities from Maine to California now specify *Crapo* Galvanized Products on all new and replacement work.

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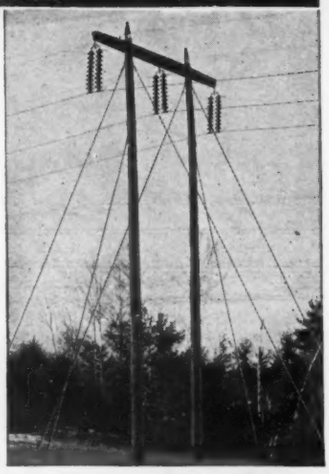

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House public utilities committee, but was then re-referred after Morris L. Cooke filed a protest against it.

•

Italian Cities Show Variety of Service

Electrical manufacturers interested in the market possibilities of Italy will be helped by having a copy of No. 41 of the series issued by the Electrical Division of the Bureau of Foreign and Domestic Commerce under the title "World Power Manual and Electrical Exporters' Handbook," which contains numerous statistics on electric service in that country.

This publication reveals a considerable diversity in the kind of current supplied in the larger cities. While alternating or three-phase current at 50 cycles predominates, there are numerous instances of 42 and 45 cycles. Nor is there the uniformity as to voltage that is found in the United States. Common values found in Italy are 127/220, 115/200, 150/260, 220/350, 144/250, 110/190. A few instances of direct current service at 110, 125, 150, 220, and 250 appear in the list.

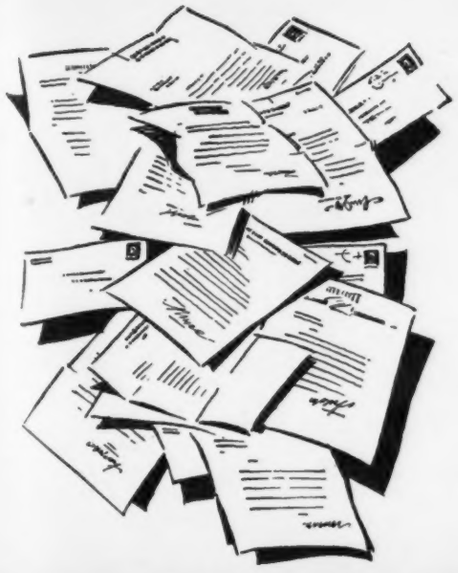
These technical differences, together with the known policy of making the country self-sustaining and limiting importations from abroad, would seem to render the Italian market hopeless so far as American exporters are concerned.

A further hindrance to more rapid electrification is the high cost of current for domestic use. This is stated to be subject to taxes from local and central governments, frequently amounting to 50 per cent of the total cost.

•

300 Miles of British Roads to Have Mercury Lighting

More than 300 miles of road in the Greater London area will soon have the mercury discharge system of diffused lighting. The installation of mercury discharge lighting is now proceeding in seven important London districts. In a few months there will be 230 miles of mercury discharge lighting along the outer London roads and 80 along those of inner London. Throughout the whole of the British Isles more than 500 miles of roads will then be lighted by the new system.



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Low gas and oil costs are only a part of Ford V-8 Truck and Commercial Car economy. Maintenance expense is also low because sound design, quality materials and precision manufacture make trips to the repair shop few and far between.

When parts replacements do become necessary, the cost is small. For example, after tens of thousands of miles of service the V-8 engine can be exchanged for a factory-reconditioned engine at a cost much lower than an ordinary engine overhaul. This exchange can be made in just a few hours, reducing the idle time of the unit. This plan restores original performance and greatly lengthens the useful life of the entire vehicle. In addition to the engine, many other factory-reconditioned parts are available at low cost.

Before you buy any new truck this year, ask your Ford dealer for details about this money-saving plan. Set a date for an "on-the-job" test of a Ford V-8 Truck or Commercial Car under your own operating conditions.

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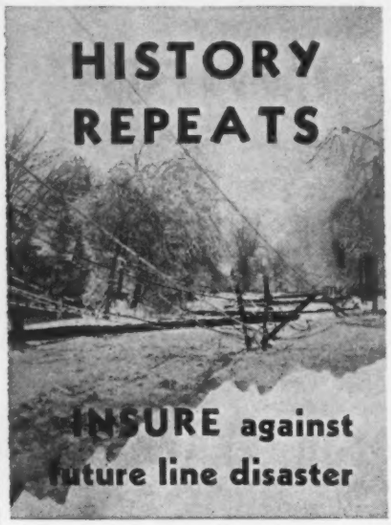
Convenient, economical terms through the Authorized Ford Finance Plans of the Universal Credit Company

FORD V-8 TRUCKS *and commercial cars*



A sleet and ice storm strikes again wrecking power lines, pulling down thousands of poles, leaving cities in darkness without power and costing utilities many thousands of dollars for line rebuilding and loss of service. It happens again and again without warning and yet many lines are built and rebuilt with inadequate protection against such destruction.

More and better guying and anchoring will pay for itself many times during the life of the line. The average anchor cost is about 1% of the total line cost—cheap insurance against such disaster, if properly done. However, any old anchor won't do for every condition. That is why the A. B. Chance Company makes so many types and sizes — AN ANCHOR FOR EVERY JOB.

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STEEL 4-WAY

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A·B·CHANCE CO. Utilities Division
CENTRALIA MISSOURI

Rural Lines Grants Total $1,309,000

Allotments totaling $1,309,000 for rural electric lines in West Virginia, Oklahoma, Minnesota, Texas, Mississippi, Ohio and Pennsylvania were announced recently by the Rural Electrification Administration. The R.E.A. has also announced the execution of a loan contract with an R.E.A. borrower in Virginia. In addition, R.E.A. was advised of the awarding of a contract for construction of an R.E.A. financed project in Tennessee. Invitations have been issued to bid on construction of a project in Georgia.

Allotments

WEST VIRGINIA—An allotment of $172,000 to a co-operative being formed in Hardy County to build over 163 miles of lines to serve 573 customers in Hardy and Hampshire Counties.

MINNESOTA—An additional $52,000 allotted to the Goodhue County Co-operative Electric Association, Redwing.

MISSISSIPPI—Northeastern Mississippi Electric Power Association, Abbeville, an allotment of $100,000 to be used for 107 miles of rural lines to serve 594 customers in Marshall, Pontotoc, Union and Lafayette Counties.

OHIO—Morrow Rural Electric Co-operative, Inc., Mount Gilead, will build 260 miles of lines in Knox, Morrow and Richland Counties, to serve 950 customers. The R.E.A. allotment is $250,000.

OKLAHOMA—Oklahoma Municipal League has developed a project in Caddo, Grady and Comanche Counties. A local co-operative is being organized. When completed this project will total about 378 miles of line to serve 1,100 customers. R.E.A. has allotted $180,000 to begin construction.

PENNSYLVANIA—A substation will be constructed with an additional allotment of $25,000 to the Northwestern Rural Electric Co-operative Association of Meadville.

TEXAS—Texas State Rural Electrification Board of Greenville, allotted $170,000 to build 183 miles of rural lines in Hunt and Collin Counties to serve 558 customers. Tri-County Electric Company, with headquarters in Waco, allotted $360,000 for lines in Rains, Hunt and Hopkins Counties. Some 1,314 customers will be served by the 400 miles of lines to be constructed.

Loan contracts

VIRGINIA—Under terms of a loan contract just executed, the Bull Run Power Company of Manassas, may use up to $86,000 for 60 miles of rural lines in Fairfax and Prince William Counties to serve 322 customers.

Construction contracts

TENNESSEEE—Southwest Tennessee Electric Membership Corporation, Jackson, has been awarded a contract for construction of 275 miles of lines to serve 1,085 customers. The estimated cost of the line is $290,000.

Last month a total allotment of $1,120,000 was made for rural

Fargo's new 4-jaw gripping unit develops full conductor strength. With the Safety Zone feature, even burred end wires cannot slip. Tapered ends prevent insertion of oversize wires. Aligned side holes in the high content copper shell insure quick drainage . . . admit a plain screw driver tip for handy releasing of wires. Strong phosphor bronze spring. Write to Line Material Co., So. Milwaukee, Wis., for full information.

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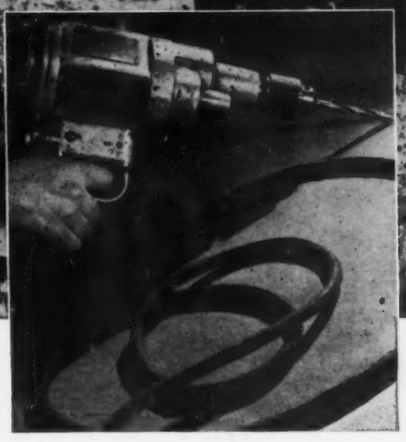

ELECTRICAL cords and cables are literally the "lifelines" of production. When they fail production stops . . . trouble and costs pile up.

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Amerclad Cords and Cables consist of one or more conductors encased in a protective sheath of tough, resilient rubber. The rubber is a strong, efficient protection, particularly in portable cables, against water and abrasive wear, and its flexibility makes it possible to move the cords and cables with ease.

No matter what size cords or cables you need, you can get the advantages of Amerclad Construction. For Amerclad Cords and Cables range in size from the largest rubber-sheathed cable in the world to small cords no larger than a lead pencil.

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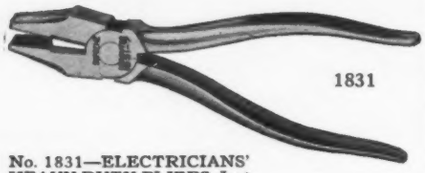
No. 4601—ELECTRICIANS' DIAGONAL CUTTING PLIERS made especially for close cutting. Forged from special plier steel and precisely fitted for exact work. Sizes 4½" to 7½".

No. 1661—NEEDLE NOSE SIDE CUTTING PLIERS. A fine slender nosed, tapered point plier, a standard tool for most types of electrical work. 6" only.



No. 1831—ELECTRICIANS' HEAVY DUTY PLIERS. Just the thing for general wiring work. Strongly constructed with sturdy wire cutters. 4" to 8" sizes.

No. 1781—EXTRA LONG NOSED PLIERS. Indispensable for use in "tight spots" where the work is hard to reach. Has side cutter. 7"only.

KRAEUTER & CO.
(Pronounced KROY-TER)
NEWARK, N. J.

Manufacturers of Highest Quality Pliers and Tools Since 1860

electric line construction extending into 15 of Louisiana's 64 parishes. Over 4,600 rural customers will receive service for the first time over the new lines, it was stated. Four newly formed electric distribution cooperatives will divide this allotment.

Five allotments were also made early last month, totaling $810,000, in Kentucky, Minnesota, Oklahoma, Oregon and Washington and allotments totaling $335,000 for projects in New Jersey, Pennsylvania, and Virginia were announced.

•

Nebraska Plan Filed With Federal Board

Application has been filed with the Federal Power Commission by the Central Nebraska Public Power and Irrigation District, Hastings, Neb., for a major license granting construction of a flood control, irrigation and power project, designated by the commission as Project No. 1417, on the North Platte and Platte Rivers in Nebraska. The project is being financed by a loan and grant from P.W.A.

Power features involved include: Three power plants at drops along the canal to be known as the Jeffrey Canyon Plant, the Johnson Canyon Plant No. 1 and the Johnson Canyon Plant No. 2, each with an installed capacity of 18,000 kw., and provision at Johnson Canyon Plant No. 2 for an additional 18,000 kw. installed capacity at some later date; approximately 354 miles of 115,000-volt transmission lines connecting the power plants with each other, with the lines of the Platte Valley Public Power and Irrigation District, and with various substations; approximately 40 miles of 66,000-volt transmission line from Lincoln to Beatrice, and approximately 325 miles of 34,500-volt lines from main to secondary substations in the southern portion of Nebraska.

The power to be developed will be sold at wholesale to either public or private organizations, the application states.

•

Survey Shows 5,000 Air Units Placed in Year

More than a fourth of the installations of air-conditioning equipment last year were in private homes, according to a survey completed by the Kelvin Homes division of Nash-Kelvinator Corporation.

The survey reveals greatly increased emphasis on domestic units in the rapidly growing air conditioning market, it was said. Kelvin Homes estimated that during last year there were more than 5,000 installations, of which about 1,600 were in homes.

•

Truck Output Shows Sharp Gain in Year

Continued evidence of growing electrification and modernization of industry is seen in the increasing shipments of electric industrial trucks and tractors. As reported to the Bureau of the Census by ten leading manufacturers, shipments totaled 152 in January, as compared with 129 in December, 1936; 84 in January, 1936, and 42 in January, 1935. The figures show an increase of 81 per cent compared with a year ago and 3.62 times as great as it was two years ago.

Shipments during 1936 totaled 1,253 units, an increase of 36 per cent over the preceding year. About 7 per cent were for export. New orders totaled 1,426 during 1936, against 990 during 1935.

•

Rules Made on Meter Tests

Under a recent order issued by the Utah Public Service Commission all electric utility companies in Utah must have high-grade reference testing meters, which will be subject to examination at stated intervals by the department of engineering at the University of Utah. The order provides that electrical utilities having 5,000 or more metered customers must have their testing meter calibrated every six months. Companies having 500 to 5,000 meters shall have their testing meter calibrated every twelve months, and those with less shall have the tests made every twenty-four months.

•

License Transfer Denied

Federal Power Commission has denied the joint application by the Broad River Power Company and the Lexington Water Power Company, licensee under the license for Project No. 516, located on the Saluda River in South Carolina, for approval of the sale and transfer of all the property and franchises, including said license, of the latter company to the former company. The companies are members of the Associated Gas & Electric System. Last month the South Carolina Public Service Commission by formal order

FOR SAFETY, DURABILITY

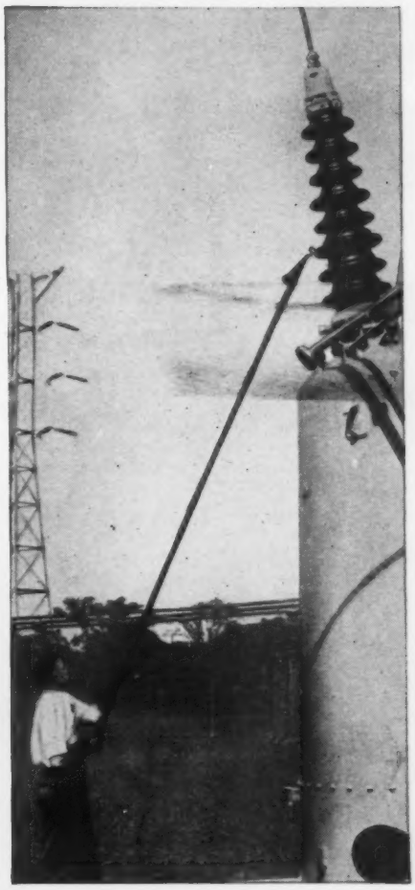
. . . *Bakelite Materials*

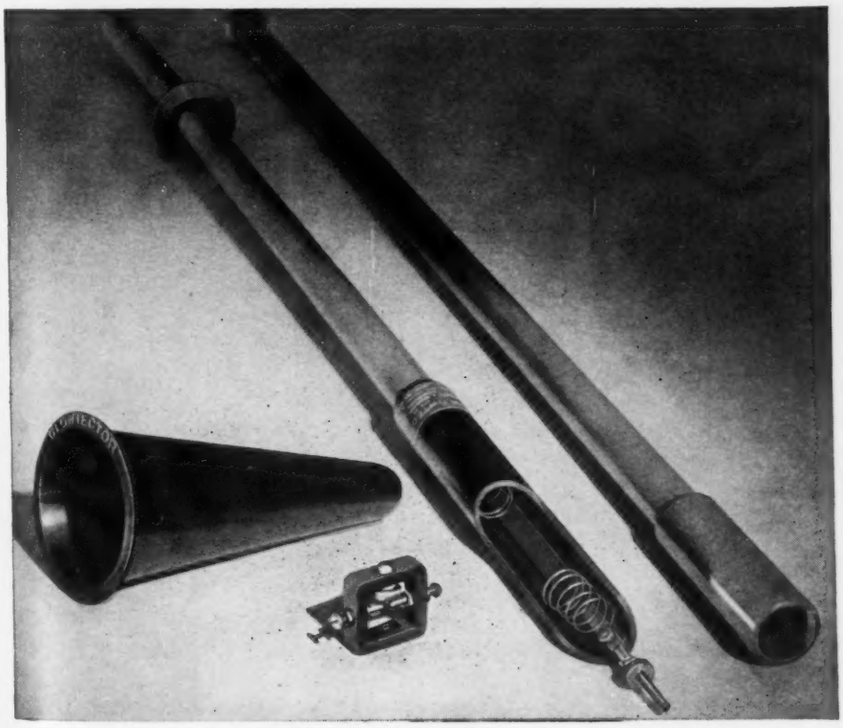
MANY striking improvements in electrical devices and equipment have been made possible by use of Bakelite Materials. For dielectric purposes, these products provide the unusual advantage of high insulation value combined with mechanical strength, toughness and lightweight.

A typical instance where this combination of properties proves almost indispensable is in the "Glowtector" live-line detector illustrated. Because the jointed handle, tube hood and spark-gap frame are completely formed from Bakelite Materials, this device affords complete protection to operators testing lines at 2,200 volts and more.

In addition to safety, the Bakelite Molded and Bakelite Laminated parts of the "Glowtector" furnish ample sturdiness and toughness to withstand rough service without breakage or deterioration. Their lightness in weight provides ready handling, even in testing high lines from poles or towers.

These merits of Bakelite Materials, plus their high resistance to fumes, chemicals, heat and weather, adapt them to hundreds of other advantageous uses in electrical equipment. Users and designers of all types of electrical devices are invited to consult us regarding any proposed application of these durable dielectrics.





Write for useful reference booklets 3M, "Bakelite Molded" and 3L, "Bakelite Laminated".

High voltage lines are safely tested with the "Glowtector", produced by Railway & Indust. Eng. Co. The Bakelite Laminated (Synthane) handle and spark gap frame, and Bakelite Molded hood furnish dependable insulation.

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PAGE made America's first woven wire fence in 1883, and has pioneered most fence improvements ever since.

With no obligation to any one metal, PAGE is the only fence consistently identified with the greatest names in metals. PAGE pioneered and perfected PAGE-ARMCO Ingot Iron fencing to provide unusual resistance to salt spray, chemical fumes and other conditions harmful to even finest copper-bearing galvanized steel. Its cost has been lowered to but little above that of steel.

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refused to approve the acquisition of the Lexington properties by the Broad River Company. The Broad River utility has applied to the state commission for a rehearing (ELECTRICAL WORLD, February 20, page 18).

•

Record Sales Seen for Washing Units

American women will put at least 2,250,000 home-laundering appliances into their homes this year and the proportion of full installations of both units will break all records, according to C. G. Frantz, president of the Apex Electrical Manufacturing Company, Cleveland. Speaking before the recent meeting in Chicago of the American Washing Machine Manufacturers' Association, as he began his third successive term as president, Mr. Frantz stated that piecemeal mechanizing of home laundering is on its way out in America.

William H. Voss of Voss Brothers Manufacturing Company, Davenport, Iowa, was elected treasurer for the thirtieth successive year.

•

Hotpoint Dorchester Range Offers Several New Features

The widespread popularity of the Hotpoint Dorchester electric range has prompted the Edison General Electric Appliance Company of Chicago to offer the range in full porcelain enamel finish, according to the announcement by D. C. Marble, range sales manager. The range also features a new charcoal type smokeless broiler pan, new type oven lining and an improved type switchboard assembly.

•

Sues to Test Franchise

Suit to test the validity of the Kentucky Utilities Company's franchise in the city of Middlesboro was filed recently in the United States District Court in Lexington. The suit was filed by the Continental Illinois National Bank & Trust Company of Chicago, trustee under mortgage of the utility. The city of Middlesboro was named defendant. Plaintiffs claim the right to a perpetual franchise. The suit was brought by an out-of-state corporation in federal court in an effort to protect bondholders of the utility company.

Enforced Public Ownership

[*Continued from page* 66]

Judge Gore has not affected the construction of any dams designed for flood prevention—or, for that matter, any dams whatever.

So just how the attitude of the Supreme Court about federal powers under the Constitution would prevent the government doing something to protect the Ohio and other valleys from flood devastation puzzles some.

But not the liberals! They see the analogy clearly enough. The idea is that unless the federal government can have complete leeway to go all the way in taking over the privately owned electric business the economic justification for dams to control floods is not sufficient! Which is sound enough for liberals still shocked that Congress would not vote the money to continue work on Passamaquoddy!

•

Home Owners Demand Electrical Equipment

A survey conducted by the Nash-Kelvinator Corporation shows that more than 11,000 present and prospective home owners demand modern electrical equipment. The price which the largest percentage wanted to pay for a home averaged between $7,000 and $8,500.

Air conditioning was demanded by 30 per cent and preferred by 65 per cent with thermostatic control demanded by 50 per cent and preferred by an additional 47 per cent. Convenience features demanded by most of those included an automatic hot water heater, a mechanical refrigerator and an over-heat-controlled range.

•

Garden Lighting Campaign

The Christmas lights which gleamed in 27,000 Denver homes and yards last December, breaking all previous display records, were the inspiration for plans already under way for a vigorous yard and garden lighting activity this spring and summer. As with the Christmas lighting program, the summer night beautification campaign will be sponsored by the Rocky Mountain Electrical Association, not only in Denver but throughout its territory. This year various interests will join with the Electrical Association in promoting this program. As in the past, a series of prize contests will serve to stimulate interest.